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(56) References cited:
EP-A- 0 337 055
AU-A- 425 421
DE-A- 2 011 234
FR-A- 413 969
GB-A- 1 533 785
US-A- 2 449 920
US-A- 5 005 877
EP-A- 0 530 485
BE-A- 525 808
FR-A- 327 557
GB-A- J5 401
US-A- 1 587 079
US-A- 2 868 563

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Description

[0001] The present invention relates to a coupling apparatus for coupling two members, e.g., hoses such as fire hoses, or a pump and a hose to each other.

[0002] More specifically, the present invention is constituted by a pair of couplers which have the same structure and are complementary. These couplers are axially fitted and coupled to each other.

[0003] As a hose coupling apparatus for coupling fire hoses to each other, conventionally, ones which are disclosed in, e.g., Jpn. UM Appln. KOKOKU Publication No. 63-37593, Jpn. UM Appln. KOKAI Publication No. 64-53593, Jpn. UM Appln. KOKOKU Publication No. 2-34549, Jpn. UM Appln. KOKAI Publication No. 59-193443, and the like are known.

[0004] Each of Jpn. UM Appln. KOKOKU Publication No. 63-37593 and Jpn. UM Appln. KOKAI Publication No. 64-53593 discloses hose couplers having substantially the same structures.

[0005] In these couplers, a rotational ring is rotatably fitted on the outer circumferential surface of a cylindrical main body of each coupler, and a pair of locking pawls and a pair of wedge-shaped projecting ridges are provided to this rotational ring. When the two rotational rings are rotated, the locking pawls of one rotational ring are fitted with the wedge-shaped projecting ridges of the other rotational ring, thereby coupling the pair of couplers to each other.

[0006] The hose couplers disclosed in each of Jpn. UM Appln. KOKOKU Publication No. 2-34549 and Jpn. UM Appln. KOKAI Publication No. 59-193443 have basically and substantially the same structures and are constituted by a male coupler and a female coupler. A locking projection is formed on the male coupler, and a locking pawl to fit on the locking projection is provided to the female coupler. When the male and female couplers are axially abutted against each other, the locking projection and the locking pawl are fitted to each other, thereby coupling the male and female couplers.

[0007] According to the former couplers, the pair of couplers are positioned and abutted against each other, and the rotational rings are rotated to fit the locking pawls on the wedge-shaped projecting ridges. Operations for coupling and disconnecting the couplers are cumbersome. Thus, these couplers are not suitable as couplers which must quickly couple hoses, e.g., fire hoses, or disconnect them.

[0008] The fire hose is often dragged during fire fighting. If the locking pawls project as in the former coupler, the locking pawls tend to be interfered by obstacles. Then, the locking pawls may be deformed or broken to undesirably disconnect the couplers. In the former couplers, since the locking pawls project from the rotational rings in the cantilevered manner, when a high pressure is applied to the hose, a bending load acts on the locking pawl portions to bend the locking pawls. Then, the clamped state of the couplers can be loosened, leading to water leakage.

[0009] According to the latter couplers, the locking projection and the locking pawl are fitted to each other only by axially abutting the male and female couplers against each other, thereby coupling the male and female couplers. The coupling and disconnecting operations of the couplers are simple when compared to the operations of the former couplers. However, in the latter couplers, disengaging pieces for disengaging the locking projection from the locking pawls are provided to be axially slidable. When the fire hose is dragged during fire fighting, the disengaging pieces are slid to disengage the locking projection from the locking pawl, so that these couplers may be undesirably separated from each other.

[0010] In the latter couplers, a male coupler is attached to one end portion of the hose, and a female coupler is attached to the other end portion of the hose. When a plurality of hoses are to be connected to obtain an extended hose, the male coupler of one hose must be coupled to the female coupler of the other hose. In particular, when the latter couplers are applied to the couplers for fire hoses, if a plurality of hoses are to be straightened and coupled to each other in a haste, the two couplers sometimes turn out to be male couplers and thus cannot be coupled to each other. In the latter couplers, two types of metal members, i.e., female and male couplers, must be manufactured, leading to an increase in cost.

[0011] FR-A-413969 describes a coupling apparatus comprising a pair of complementary couplers that are to be coupled to each other and have the same structure. Each coupler comprises a cylindrical body having a pin with a conical top. Further, each body is provided with an opening in which the pin of the opposite coupler body engages when coupling the pair of couplers. In the engaged position of the pin same is retained by a catch lever which engages in a groove formed in the periphery of the pin. However, in this arrangement the problem arises, that in a coupling free state of the pair of couplers the pins of each coupler body may be damaged when striking other elements, for example during removal work of hoses comprising such couplers after using same.

[0012] It is an object of the present invention to provide a coupling apparatus according to the preamble portion of claim 1 which can prevent damaging of locking members of a coupler body by catching or striking any other element.

[0013] According to the invention, the object is solved by the features of claim 1.

[0014] The sub-claims contain further preferred embodiments of the invention.

[0015] Therefore, according to the present invention, there is provided a coupling apparatus comprising a pair of couplers, wherein the pair of couplers have substantially the same structure, each of the cylindrical bodies of the couplers has at least a pair of axially projectable

locking members and to-be-locked members engageable with the locking members, and when the pair of couplers are axially abutted against each other and the locking members of one coupler are fitted with the to-be-locked members of the other coupler, the pair of couplers are coupled.

[0016] When the present invention is applied to a hose coupling apparatus, disengaging mechanisms for disengaging the locking members from the to-be-locked members are provided.

[0017] The locking members are axially movable with respect to the cylindrical bodies and biased by springs to move backward in a direction opposite to the distal ends of the cylindrical bodies. When the couplers are in a disconnected state, the locking members are moved backward with respect to the cylindrical bodies, and the distal end portions of the locking members are maintained in a state not or only slightly projecting from the cylindrical bodies. When the couplers are in a coupled state, the locking members are moved forward toward the distal ends of the cylindrical bodies against the biasing force of the springs and engage with the to-be-locked members of the opposite couplers. Thus, while these couplers are disconnected from each other, the locking members are prevented from being damaged.

[0018] Preferably, the disengaging mechanisms include disengaging pieces movable in the axial direction of the cylindrical bodies. When the disengaging pieces are axially moved, they are brought into contact with the to-be-locked members to set the to-be-locked members in a disengaged state, thereby disengaging the to-be-locked members from the locking members. In this case, more preferably, the disengaging pieces are moved in directions to come close to each other, thereby disengaging the locking members and the to-be-locked members of the two couplers from each other. Therefore, for example, even if this coupling apparatus is caught by something when a fire hose is dragged, the disengaging pieces of the two couplers will not axially move to disengage the locking members from the to-be-locked members of the two couplers simultaneously, and these couplers will not be undesirably disconnected from each other.

[0019] Preferably, in the disengaging mechanisms, the to-be-locked members are moved outwardly in the radial direction of the cylindrical bodies, thereby disengaging the to-be-locked members from the locking members. Alternatively, the to-be-locked members are rotated in the circumferential direction of the cylindrical bodies, thereby disengaging the to-be-locked members from the locking members. In this coupling apparatus, coupled couplers will be prevented from being undesirably disconnected from each other when the fire hose is dragged, in the same manner as described above.

[0020] Preferably, when the pair of couplers are coupled to each other, the distal end faces of their cylindrical bodies are abutted against each other through packing members. Hence, when these couplers are to be coupled, they need not be fitted to each other. Resistance during coupling is decreased, and the coupling operation is facilitated.

[0021] Preferably, the pair of couplers have protection cylinders located at least inside or outside the locking members and the to-be-locked members to reinforce these members. Thus, even when a high pressure is applied to the hose, the locking members and the to-be-locked members will not be bent to loosen the couplers, causing water leakage.

[0022] Furthermore, preferably, the pair of couplers have communication wire terminals at the end faces of their cylindrical bodies. When the couplers are coupled to each other, the connection terminals of the two couplers are connected to each other. As a result, e.g., voice communication with a fire fighter spraying water with the fire hose is enabled.

[0023] The pair of couplers of the coupling apparatus of the present invention have the same structure and are complementary to each other. The cylindrical bodies of the couplers have at least the pair of locking members and the to-be-locked members engageable with the locking members. Thus, when the locking members of one coupler are positioned in the to-be-locked members of the other coupler and the couplers are axially abutted against each other, the locking members and the to-be-locked members are locked with each other, thereby coupling the couplers.

[0024] The locked state of the locking members and the to-be-locked members is released by the disengaging mechanisms provided to the cylindrical bodies, so that the coupled couplers can be disconnected from each other easily.

[0025] This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a longitudinal sectional view of coupling metal members in the disconnected state according to the first embodiment of the present invention;

FIG. 2 is a longitudinal sectional view of the coupling metal members in a state during coupling according to the first embodiment of the present invention;

FIG. 3 is a longitudinal sectional view of the coupling metal members in the coupled state according to the first embodiment of the present invention;

FIG. 4 is a perspective view of the locking members of the coupling metal members according to the first embodiment of the present invention;

FIG. 5 is a sectional view taken along the line 13 - 13 of FIG. 4;

FIG. 6 is a sectional view taken along the line 14 - 14 of FIG. 4;

FIG. 7 is a front view of disengaging mechanisms of the first embodiment of the present invention;

FIG. 8 is a sectional view taken along the line 16 - 16 of FIG. 7;

FIG. 9 is a sectional view taken along the line 17 -

17 of FIG. 7;
FIG. 10 is a front view of disengaging mechanisms according to the second embodiment of the present invention;
FIG. 11 is a sectional view taken along the line 19 - 19 of FIG. 10;
FIG. 12 is a sectional view taken along the line 20 - 20 of FIG. 10;
FIG. 13 is a sectional view of another state taken along the line 20 - 20 of FIG. 10;
FIG. 14 is a cross-sectional view of disengaging mechanisms according to the third embodiment of the present invention;
FIG. 15 is a longitudinal sectional view of the disengaging mechanisms according to the third embodiment of the present invention;
FIG. 16 is a sectional view taken along the line 24 - 24 of FIG. 14;
FIG. 17 is a sectional view taken along the line 25 - 25 of FIG. 14 ;
FIG. 18 is a cross-sectional view of another state of the disengaging mechanisms according to the third embodiment of the present invention;
FIG. 19 is a longitudinal sectional view of this another state of the disengaging mechanisms according to the third embodiment of the present invention;
FIG. 20 is a cross-sectional view of disengaging mechanisms according to the fourth embodiment of the present invention;
FIG. 21 is a longitudinal sectional view of the disengaging mechanisms according to the fourth embodiment of the present invention;
FIG. 22 is a sectional view taken along the line 30 - 30 of FIG. 20;
FIG. 23 is a sectional view taken along the line 31 - 31 of FIG. 20;
FIG. 24 is a cross-sectional view of another state of the disengaging mechanisms according to the fourth embodiment of the present invention;
FIG. 25 is a longitudinal sectional view of this another state of the disengaging mechanisms according to the fourth embodiment of the present invention;
FIG. 26 is a cross-sectional view of disengaging mechanisms according to the fifth embodiment of the present invention;
FIG. 27 is a longitudinal sectional view of the disengaging mechanisms according to the fifth embodiment of the present invention;
FIG. 28 is a cross-sectional view of another state of the disengaging mechanisms according to the fifth embodiment of the present invention;
FIG. 29 is a longitudinal sectional view of this another state of the disengaging mechanisms according to the fifth embodiment of the present invention;
FIG. 30 is a longitudinal sectional view of the sixth embodiment of the present invention;
FIG. 31 is a longitudinal sectional view of the coupled state of the sixth embodiment of the present invention;
FIG. 32 is a sectional view taken along the line 40 - 40 of FIG. 31;
FIG. 33 is a sectional view taken along the line 41 - 41 of FIG. 31;
FIG. 34 is a longitudinal sectional view according to the seventh embodiment of the present invention;
FIG. 35 is a longitudinal sectional view of the coupled state of the seventh embodiment of the present invention; and
FIG. 36 is a sectional view taken along the line 44 - 44 of FIG. 35.

[0026] The preferred embodiments of the present invention will be described with reference to the accompanying drawings. An embodiment in which the locking members are axially movable with respect to the cylindrical bodies will be described. FIGS. 1 to 9 show the first embodiment of the present invention. This embodiment relates to a fire hose coupling apparatus in which handling and attachment/detachment are especially facilitated.

[0027] This coupling apparatus is constituted by a pair of couplers 101A and 101B having the same structure, shape, and size. In FIGS. 1 to 9, the identical portions of the couplers 101A and 101B are denoted by the same reference numerals. FIG. 1 is a longitudinal sectional view showing a disconnected state, FIG. 2 is a longitudinal sectional view showing a state during coupling, and FIG. 3 is a longitudinal sectional view showing a coupled state. FIGS. 1 to 3 are longitudinal sectional views taken along the lines, e.g., the line 9 - 9, of FIG. 5.

[0028] The entire portions of these couplers 101A and 101B are made of an aluminum alloy or other materials. Each coupler has a cylindrical body 101, and a plurality of projecting ridge portions 105 having a saw-tooth section are formed on the inner circumferential surface of the cylindrical body 101. A fire hose 102 is inserted inside each cylindrical body 101, and a stop ring 103 is fitted under pressure on the inner circumferential surface of the fire hose 102. The fire hose 102 is sandwiched under pressure between the stop ring 103 and the projecting ridge portions 105 on the inner circumferential surface of the cylindrical body 101 and connected to the cylindrical body 101 to maintain water tightness. Note that the fire hoses 102, the stop rings 103, and the openings at the distal end portions of the cylindrical bodies 101 are set to have the substantially same inner diameter. Thus, when the couplers 101A and 101B are coupled to each other as will be described below, the fire hoses 102 and the couplers 101A and 101B are connected smoothly not to form stepped portions or the like between the fire hoses 102 and the inner surfaces of the couplers 101A and 101B, so that no resistance is applied to water flowing through the fire hoses 102 and the couplers 101A and 101B.

[0029] The cylindrical bodies 101 are connected to

each other as their distal end faces are concentrically abutted against each other. An annular packing member 104 is mounted on the distal end face of each cylindrical body 101. These packing members 104 are made of an elastic material, e.g., hard synthetic rubber, and form the shape of lips. Accordingly, these packing members 104 are abutted against each other to maintain water tightness. Also, the lip-shaped packing members 104 are deformed by a water pressure to urge against each other, thereby maintaining water tightness more reliably.

[0030] A protection cylinder 110 is mounted on the outer circumferential surface of each cylindrical body 101. The distal end portion of each protection cylinder 110 is mounted on the outer circumferential surface of the corresponding cylindrical body 101 to threadably engage with it. A pair of locking piece guide holes 111 are formed in each protection cylinder 110. These locking piece guide holes 111 are formed between arcuated grooves, formed in the inner circumferential surface of the protection cylinder 110, and the outer circumferential surface of the corresponding cylindrical body 101. The locking piece guide holes 111 are formed to axially extend through the entire length of the corresponding protection cylinder 110. Each of the pair of locking piece guide holes 111 is formed to extend in a range slightly narrower than 90° in the circumferential direction. The pair of locking piece guide holes 111 are arranged symmetrical to be separated from each other by 180° in the circumferential direction.

[0031] A pair of locking piece insertion holes 112 are formed in the inner circumferential surface of each protection cylinder 110. Similar to the locking piece guide holes 111, these locking piece insertion holes 112 are arcuated holes formed between the grooves formed in the inner circumferential surface of the corresponding protection cylinder 110 and the outer circumferential surface of this protection cylinder 110. Each locking piece insertion hole 112 is formed to extend in a range slightly narrower than 90° in the circumferential direction. The locking piece insertion holes 112 are arranged symmetrically to be separated from each other by 180°, and are formed to be separated from the locking piece guide holes 111 by 90°. Different from the locking piece guide holes 111, the locking piece insertion holes 112 are formed to axially extend only from the distal end face of the corresponding protection cylinder 110 by a predetermined length and do not extend through the entire length of the corresponding protection cylinder 110. To couple the couplers 101A and 101B to each other, one coupler 101A and the other coupler 101B are abutted against each other such that their locking piece guide holes 111 and locking piece insertion holes 112 are separated from each other by 90° in the circumferential direction. Thus, the locking piece guide holes 111 of one coupler 101A and the locking piece insertion holes 112 of the other coupler 101B oppose each other.

[0032] Locking members 120 are fitted on the outer circumferential surface of each cylindrical body 101 to be axially movable. FIG. 4 shows only the locking members 120 of the two couplers 101A and 101B. Each pair of locking members 120 have a common annular portion 121 at their proximal end portions, and a pair of locking pieces 122 integrally project from the annular portion 121 toward the distal end portion of the corresponding coupler. Each locking piece 122 has an arcuated section and is formed to extend in a range slightly narrower than 90° in the circumferential direction. Each pair of locking pieces 122 are arranged symmetrically to be separated from each other by 180° in the circumferential direction. Each locking piece 122 has a thick-walled portion 123 and a thin-walled portion 124 at its proximal and distal end portions, respectively, and a locking projecting portion 125 contiguous in the circumferential direction is formed at the distal end portion of the thin-walled portion 124. Notched portions 128 are formed between the locking pieces 122.

[0033] The inner circumferential surfaces of the locking members 120 are slidably fitted on the outer circumferential surface of the corresponding cylindrical body 101, and their locking pieces 122 are slidably inserted in the pair of locking piece guide holes 111 of the corresponding protection cylinder 110. Accordingly, these locking members 120 are guided by the outer circumferential surface of the corresponding cylindrical body 101 and the locking piece guide holes 111 of the corresponding protection cylinder 110 to be slidable in the axial direction of the corresponding cylindrical body 101. An elastic member, e.g., a coil spring 127, is interposed between the annular portion 121 of the locking member 120 and the corresponding cylindrical body 101. The locking members 120 are biased by the spring 127 in a direction to move backward. Accordingly, as shown in FIG. 1, when the couplers 101A and 101B are not coupled to each other, the locking pieces 122 of their locking members 120 do not project from the distal end faces of the cylindrical bodies 101, and are accommodated in the locking piece guide holes 111 of the corresponding protection cylinders 110. Reference numerals 126 denote set screws 126 for preventing removal of the locking members 120. The retreat positions of the locking members 120 are regulated by the set screws 126. In this embodiment, when the locking members 120 are at their retreat positions, the distal end portions of their locking pieces 122 slightly project from the distal end faces of the corresponding cylindrical bodies 101.

[0034] Locking piece accommodating holes 131 are radially formed in each protection cylinder 110 at positions corresponding to the locking piece insertion holes 112, and to-be-locked members, e.g., arcuated locking pieces 130, are accommodated in the locking piece accommodating holes 131 to be axially slidable. These locking pieces 130 have inclined inner circumferential surfaces, and these inner circumferential surface portions project into the corresponding locking piece insertion holes 112. Note that the locking pieces 130 are formed to have a width smaller than that of the locking

pieces 122.

[0035] When the couplers 101A and 101B are to be coupled to each other, they are rotated in the circumferential direction by 90°, and their cylindrical bodies 101 are abutted against each other. Therefore, the locking piece guide holes 111 of the protection cylinders 110 oppose the locking piece insertion holes 112 of the opposite protection cylinders 110. In this state, the locking members 120 are axially moved forward against the biasing force of the springs 127. Then, as shown in FIG. 2, the locking pieces 122 project and are inserted and fitted in the locking piece insertion holes 112 of the opposite protection cylinders 110. When the distal end portions of the locking pieces 122 are brought into contact with the inclined surface portions of the locking pieces 130 to move the locking pieces 130 outwardly in the radial direction and the locking projecting portions 125 at the distal end portions of the locking pieces 122 move over the locking pieces 130, the locking pieces 130 are radially moved inwardly and are engaged with the locking projecting portions 125 of the locking pieces 122, as shown in FIG. 3, thereby coupling the couplers 101A and 101B.

[0036] Disengaging mechanisms 140 for radially biasing the locking pieces 130 inwardly and disengaging the locking projecting portions 125 of the locking pieces 122 and the locking pieces 130 from each other will be described. Each disengaging mechanism 140 has an elastic ring 141 as shown in FIG. 7. The elastic ring 141 is obtained by forming a plate spring member into a substantially elliptic ring. A grip ring 142 made of a flexible material, e.g., a synthetic resin or a synthetic rubber, and having a substantially T-shaped section is placed on the outer side of the elastic ring 141, and is coupled to the elastic ring 141 with a plurality of screws 143. The locking pieces 130 are mounted on the inner circumferential surface of the elastic ring 141 with the screws 143. These locking pieces 130 are arranged on the minor axis of the elliptic elastic ring 141.

[0037] The locking pieces 130 are biased inwardly in the radial direction by the elastic force of the elastic ring 141. Hence, as described above, the locking pieces 130 are engaged with the locking projecting portions 125 of the locking pieces 122 inserted in the locking piece insertion holes 112 with the biasing force of the elastic ring 141. To disengage the locking pieces 130, the elliptic elastic rings 141 are held by hands each at its two portions on the major axis, and the elastic rings 141 are deformed in a squeezing manner in the direction of the major axis. Then, the elastic rings 141 are deformed to be diameter-increased in the direction of their minor axis, and the locking pieces 130 mounted on portions of the elastic rings 141 on the minor axis are moved outwardly in the radial direction, thereby disengaging the locking pieces 122 from the locking projecting portions 125.

[0038] In this embodiment, as described above, when the couplers 101A and 101B are not coupled to each other, the locking pieces 122 of the locking members 120 are retracted in the corresponding protection cylinders 110 and do not project from the end faces of the corresponding cylindrical body 101. Thus, the locking pieces 122 will not collide against something and be damaged, or will not be caught by something.

[0039] When the couplers 101A and 101B are to be coupled, their cylindrical bodies 101 are concentrically abutted against each other such that the locking pieces 122 of the cylindrical body are shifted from those of the opposite cylindrical body 101 by 90°, as shown in FIG. 4. Subsequently, in this state, the locking members 120 are moved forward against the biasing force of the springs 127, as shown in FIG. 2. The locking pieces 122 of the locking members 120 which have moved forward are fitted on the outer circumferential surfaces of the opposite cylindrical body 101, and are inserted and fitted in the locking piece insertion holes 112 of the opposite cylindrical body 101. When the locking pieces 122 are further moved forward, as shown in FIG. 3, the locking projecting portions 125 at the distal end portions of the locking pieces 122 are engaged with the opposite locking pieces 130, thereby coupling the couplers 101A and 101B.

[0040] In this case, since the locking pieces 122 are moved forward while being fitted on the outer circumferential surfaces of the opposite cylindrical bodies 101, the cylindrical bodies 101 are held in the concentric state by the locking pieces 122 that are moving forward, so that the coupling operation is facilitated. Since the locking pieces 122 of the locking members 120 have a shape to fit to each other, as shown in FIG. 4, when they are moved forward, they are fitted with the opposite locking pieces 122 to be shifted from each other by 90° in the circumferential direction, and are moved forward while maintaining this fitted state. Thus, the couplers 101A and 101B are held to have a predetermined relationship of rotational angles until the coupling operation ends, thereby further facilitating the coupling operation.

[0041] In this embodiment, even in the disconnected state, the distal end portions of the locking pieces 122 slightly project from the distal end faces of the corresponding cylindrical bodies 101. Thus, while the couplers 101A and 101B that are in this disconnected state are abutted against each other first, the distal end portions of the projecting locking pieces 122 are fitted with the opposite cylindrical bodies 101 and with the opposite locking pieces 122 as well. In this state, the cylindrical bodies 101 are already fitted to each other concentrically while they are positioned at a predetermined rotational angle, and this state is maintained. Therefore, only the locking members 120 need be moved forward after this, further facilitating the coupling operation.

[0042] In this embodiment, each cylindrical body 101 has the pair of locking pieces 122, and the locking pieces 122 are fitted with the opposite locking pieces 122 to be shifted from them by 90°. Generally, man recognize a space with reference to vertical and horizontal orthog-

onal axes. Thus, it is easy to align a pair of engaging pieces that are fitted with an opposite pair of engaging pieces to be shifted from them by 90°, i.e., to be orthogonal. This embodiment is thus suitable for a coupling apparatus, e.g., one for fire hoses, which must perform coupling quickly under bad conditions.

[0043] To disconnect these couplers, the elastic rings 141 of the disengaging mechanism 140 are held by the hand each at its two portions on the major axis, and the elliptic elastic rings 141 are depressed in the squeezing manner in the direction of the major axis. Thus, the locking pieces 130 are moved outwardly in the radial direction, as described above, to disengage them from the locking projecting portion 125, so that the couplers 101A and 101B are disconnected from each other.

[0044] These disengaging mechanisms 140 have a simple structure and their disengaging operation is easy. Since the elastic rings 141 and the grip rings 142 have annular shapes, they will not likely be caught by something when the hose is dragged. As the hoses will not be disengaged unless the elastic rings 141 are depressed each at its two portions on the major axis simultaneously. Even if the elastic rings 141 are depressed by something, they will not be undesirably disengaged, leading to a high reliability.

[0045] FIGS. 10 to 13 show disengaging mechanisms 140 according to the second embodiment of the present invention. Each disengaging mechanism 140 has substantially the same arrangement as that of the first embodiment, except that its elastic ring 151 is made of a leaf spring which has an arcuated section in the initial state, as shown in FIGS. 11 and 13. The elastic ring 151 is obtained by forming a linear leaf spring member to have an elliptic shape and fixing the two end portions of the leaf spring member with two screws at its one locking piece 130 portion. The inner circumferential surface of a grip ring 142 identical to that described above and the outer circumferential surfaces of the locking pieces 130 identical to those of the above embodiment also have an arcuated section to correspond to the section of this leaf spring member. At the locking piece 130 portions, the leaf spring member is sandwiched under pressure between the grip ring 142 and the locking pieces 130, so that the leaf spring member is always maintained to have an arcuated section. Since the leaf spring member is elliptic, it causes buckling at the two portions on the major axis of the elliptic elastic ring 151, and is thus deformed to have a flat section, as shown in FIG. 12.

[0046] The operation and the like of the disengaging mechanism 140 of the second embodiment described above are substantially the same as those of the disengaging mechanism of the first embodiment. However, when the disengaging mechanism 140 of the second embodiment is set in the disengaged state by depressing the elastic ring 151 at its two portions on the major axis, the elliptic elastic ring 151 is deformed into a substantial circle. Thus, the two portions on the major axis of the elastic ring 151 cause buckling again, so that the elastic ring 151 is deformed to have an arcuated section, as shown in FIG. 13. This buckling provides a nodal response by disengagement upon depressing the elastic ring 151 at its two portions, thereby improving the operability.

[0047] FIGS. 14 to 19 show disengaging mechanisms 140 according to the third embodiment of the present invention. Each disengaging mechanism 140 has a movable ring 161 which is mounted to the outer circumferential surface of a protection cylinder 110 identical to that described above to be axially movable. As shown in FIG. 15, the movable ring 161 is biased by a spring 162 to be axially movable backward. The retreat position of the movable ring 161 is regulated by a set screw 165. Locking pieces 130 identical to those described above are held in the protection cylinder 110 to be movable in the radial direction.

[0048] Permanent magnets 163 are buried in each locking piece 130, and other permanent magnets 163 are buried in portions of the movable ring 161 corresponding to the locking pieces 130 as well. These permanent magnets 163 have the shape of an elongated are and are arranged such that their elongated direction coincides with the circumferential direction. The permanent magnets 163 in each locking piece 130 are axially arranged in, e.g., two rows, and the permanent magnets 163 in the movable ring 161 are axially arranged in, e. g., three rows. As shown in FIGS. 16 and 17, these permanent magnets 163 are arranged such that their N and S poles are opposite alternately. Solid portions in the drawings indicate N poles, and hollow portions in the drawings indicate S poles.

[0049] In the disengaging mechanism 140 of this embodiment, the movable ring 161 is positioned at the retreat position, as shown in FIGS. 14 and 15, by the elastic force of the spring 162. In this state, the permanent magnets 163 of the first and second rows counted from the distal end side of the movable ring 161 correspond to the permanent magnets 163 of the two rows of each locking piece 130. In this case, the N and S poles of the permanent magnets 163 of the locking pieces 130 correspond to the N and S poles of the permanent magnets 163 of the movable ring 161. These permanent magnets 163 repel each other, and the locking pieces 130 are biased inwardly in the radial direction by this repulsive force. Accordingly, when couplers 101A and 101B are coupled to each other in this state and locking pieces 122 are inserted, the locking pieces 130 are engaged with the locking pieces 122 by this magnetic repulsive biasing force.

[0050] To disengage these locking pieces, the movable ring 161 is moved forward against the biasing force of the spring 162, as shown in FIGS. 18 and 19. In this state, the permanent magnets 163 of the second and third rows counted from the distal end side of the movable ring 161 correspond to the permanent magnets 163 of the two rows of each locking piece 130, and the N and S poles of the permanent magnets 163 of the lock-

ing pieces 130 correspond to the S and N poles of the permanent magnets 163 of the movable ring 161. Thus, a magnetic attractive force is generated between these permanent magnets. The locking pieces 130 are moved outwardly in the radial direction by this attractive force, thereby disengaging the locking pieces 130 from the locking pieces 122.

[0051] In this embodiment, the magnetic repulsive and attractive forces of the permanent magnets are utilized as the biasing force for engaging the locking pieces 130 and as the biasing force for disengaging the locking pieces 130. Thus, the structure of the disengaging mechanisms 140 is simple and a failure caused by a fracture or the like of the spring does not occur, leading to a high reliability.

[0052] FIGS. 20 to 25 show disengaging mechanisms 140 according to the fourth embodiment of the present invention. Each disengaging mechanism 140 has a rotational ring 171 which is rotatably mounted on the outer circumferential surface of a protection cylinder 110. Projecting portions 176 are provided to project on the two portions of the inner circumferential surface of the rotational ring 171. These projecting portion 176 are fitted in recessed grooves 177 formed in the protection cylinder 110, and the rotational ring 171 is rotational by a length corresponding to the length of the recessed groove 177. Permanent magnets 172 are buried in each projecting portion 176 and in the two end portions of each recessed groove 177. The rotational ring 171 is biased by the repulsive and attractive forces of these permanent magnets 172 to rotate in one direction, e.g., clockwise, in FIGS. 20 and 24.

[0053] Permanent magnets 173 are buried in locking pieces 130 identical to those of the above embodiments and in portions of the rotational ring 171 corresponding to the positions of these locking pieces 130. These permanent magnets 173 have an elongated shape and are arranged such that their longitudinal direction is aligned with the axial direction. The permanent magnets 173 are arranged in a plurality of rows in the circumferential direction. In this embodiment, the permanent magnets 173 are arranged in five rows in each locking piece 130 and in six rows in the rotational ring 171, such that their N and S poles are opposite alternately.

[0054] In this embodiment, in a normal state, the rotational ring 171 is rotated in one direction by the magnetic repulsive and attractive forces of the permanent magnets 172. In this state, as shown in FIGS. 20 and 21, the N and S poles of the permanent magnets 173 of the locking pieces 130 correspond to the N and S poles of the permanent magnets 173 of the rotational ring 171. The locking pieces 130 are biased inwardly in the radial direction by the repulsive force of the permanent magnets 173. During coupling, the locking pieces 130 are engaged with locking pieces 122 by this biasing force.

[0055] To disengage these locking pieces, the rotational ring 171 is rotated, e.g., counterclockwise, against the biasing force of the permanent magnets 172. Then, the N and S poles of the permanent magnets 173 of the rotational ring 171 correspond to the S and N poles of the permanent magnets 173 of the locking pieces 130. The locking pieces 130 are moved outwardly in the radial direction by the attractive force of the permanent magnets 173, so that the locking pieces 130 are disengaged from the locking pieces 122.

[0056] In this embodiment, since permanent magnets are used for biasing both the locking pieces 130 and the rotational ring 171, no spring need be used at all and accordingly a failure caused by fracture or the like of a spring does not occur, leading to a high reliability.

[0057] FIGS. 26 to 29 show disengaging mechanisms 140 according to the eighth embodiment of the present invention. Each disengaging mechanism 140 has an elastic ring 181 made of an elastic material, e.g., a synthetic resin material. The diameter of the elastic ring 181 can be elastically enlarged, and the elastic ring 181 is rotatably fitted on the outer circumferential surface of a protection cylinder 110 identical to those described above. Wedge-shaped inclined surface members 182 are mounted at two portions of the elastic ring 181, and recessed inclined surface portions 183 corresponding to these inclined surface members 182 are formed in the outer circumferential surface of the protection cylinder 110.

[0058] Locking pieces 130 identical to those described above are mounted to the inner circumferential surface of the elastic ring 181. These locking pieces 130 are biased inwardly in the radial direction by the elastic force of the elastic ring 181, so that they are engaged with locking pieces 122. A plurality of engaging projecting portions 186 circumferentially arranged at a predetermined interval are provided to project from the distal end portion of each locking piece 122. Notched portions 187 are formed in each locking piece 130 at a predetermined interval. The width and depth of these notched portions 187 are set to be larger than the width and height, respectively, of the engaging projecting portions 186.

[0059] In this embodiment, usually, the inclined surface members 182 of the elastic ring 181 are slid down with respect to the inclined surface portions 183 due to the elastic force of the elastic ring 181, as shown in FIG. 34. In this state, the elastic ring 181 is substantially circular and its circumferential length is the shortest. In this state, the notched portions 187 of the locking pieces 130 do not correspond to the engaging projecting portions 186 of the locking pieces 122. Accordingly, the locking pieces 130 are engaged with the engaging projecting portions 186 by the elastic force of the elastic ring 181, as described above.

[0060] To disengage these locking pieces, the elastic ring 181 is rotated, e.g., counterclockwise, as shown in FIGS. 28 and 29. The locking pieces 130 are circumferentially moved with the rotational movement of the elastic ring 181. The notched portions 187 of the locking pieces 130 correspond to the engaging projecting por-

tions 186 of the locking pieces 122, so that they are disengaged from each other. Upon the rotational movement of the elastic ring 181, the inclined surface members 182 ride on the inclined surface portions 183, and the inclined surface members 182 are moved outwardly in the radial direction. In this case, the circumferential length of the elastic ring 181 is increased, so that the elastic ring 181 is stretched. When the operator releases the elastic ring 181 in this state, the inclined surface members 182 are moved inwardly in the radial and axial directions by the elastic force of the elastic ring 181 such that they slide down along the inclined surface portions 183, and the elastic ring 181 is rotated clockwise and is thus restored to the initial state shown in FIGS. 34 and 35.

[0061] FIGS. 30 and 33 show the sixth embodiment of the present invention. This embodiment has substantially the same arrangement as that of the first embodiment, expect for the arrangement of its disengaging mechanisms 260 which bias locking pieces 130 and disengage the locking pieces 130. More specifically, in this embodiment, an annular rotational member 261 is rotatably mounted on the outer circumferential surface of each protection cylinder 110. This rotational member 261 is guided by a plurality of balls 263 and can be rotated with a small resistance. The locking pieces 130 identical to those described above are held by the rotational member 261, and are moved in the circumferential direction as the rotational member 261 is rotated. These locking pieces 130 are biased inwardly in the radial direction by leaf springs 264 and are engaged with locking projecting portions 125 of inserted locking pieces 122. A grip cover 262 made of a material, e.g., synthetic rubber, and forming a slippage preventive member is mounted on the outer circumferential surface of the rotational member 261.

[0062] A spiral spring 266 obtained by forming a piano wire into a spiral shape is interposed between the rotational member 261 and the protection cylinder 110. The rotational member 261 is biased, e.g., clockwise in FIG. 33, by the power spring 266. The rotational stop position of the rotational member 261 is regulated by stop screws 263. When the rotational member 261 is located at its stop position, the locking pieces 130 correspond to locking piece insertion holes 112 and can be engaged with the locking projecting portions 125 of the locking pieces 122 to be inserted.

[0063] In this embodiment, when the rotational member 261 is rotated through, e.g, almost 90°, against the biasing force of the power spring 266, the locking pieces 130 are moved in the circumferential direction together with the rotational member 261, thereby disengaging the locking pieces 130 from the locking projecting portions 125 of the locking pieces 122. In this embodiment, since the rotational member 261 of each disengaging mechanism 260 is annular in the same manner as in the first embodiment, even when the fire hose is dragged, the rotational member 261 will not likely be caught by something. Also, since they will not be disengaged unless the rotational member 261 is rotated, even when the rotational member 261 is brought into contact with something, they will not be undesirably disengaged from each other.

[0064] This embodiment has a similar arrangement to that of the first embodiment described above except for the above respects. Portions identical to those of the first embodiment are denoted by the same reference numerals, and a description thereof will be omitted.

[0065] FIGS. 34 to 36 show the seventh embodiment of the present invention. In this embodiment, a movable cylinder 271 is fitted with each cylindrical body 101 to be axially movable and rotatable. This movable cylinder 271 is biased by a spring 127 to be moved backward. The retreat position of the movable cylinder 271 is regulated by a stop ring 275. A protection cylinder 110 is integrally mounted on the outer circumferential surface of the movable cylinder 271. This protection cylinder 110 is constituted by an inner cylinder 276 and an outer cylinder 272. Reference numeral 273 denotes a retaining ring. The protection cylinder 110 is axially moved together with the movable cylinder 271. Locking pieces 130 are provided in the protection cylinder 110 in the same manner as described above. The locking pieces 130 are biased by a leaf spring 274 inwardly in the radial direction.

[0066] Locking members 120 are mounted on the outer circumferential surface of the movable cylinder 271. The locking members 120 are also axially moved together with the movable cylinder 271 and are rotatable together with the movable cylinder 271. In this case, when the movable cylinder 271 is located at its retreat position, the distal ends of locking pieces 122 of the locking members 120 are located on substantially the same plane as that of the distal end face of a cylindrical body 101.

[0067] Disengaging mechanisms 280 that disengage the locking pieces 130 from the locking pieces 122 have an arrangement as follows. More specifically, each disengaging mechanism 280 has a pair of disengaging pieces 282. The disengaging pieces 282 have an arcuated section almost the same as that of the locking pieces 122. The disengaging pieces 282 are placed on the outer side surfaces of the locking pieces 122 to be axially slidable with respect to the locking pieces 122. The proximal end portions of these disengaging pieces 282 are mounted to an annular member 283. The annular member 283 is guided to be axially movable with respect to the outer circumferential surface of the movable cylinder 271. Thus, the annular member 283 and the disengaging pieces 282 are guided to be axially movable with respect to the movable cylinder 271, the locking members 120, and the protection cylinder 110.

[0068] In this embodiment, when couplers 101A and 101B are not coupled to each other, the locking members 120 have been moved backward together with the corresponding movable cylinders 271 and protection

cylinders 110, and the distal ends of the locking members 120 do not project from the distal end faces of the corresponding cylindrical bodies 101. When the couplers 101A and 101B are to be coupled, the distal end faces of the cylindrical bodies 101 are abutted against each other, and the locking members 120 are axially moved forward together with the movable cylinders 271 and the protection cylinders 110, thereby engaging the distal end portions of the locking pieces 122 with the opposite locking pieces 130. In this case, the locking pieces 122 and the locking pieces 130 in the protection cylinders 110 are rotational together with the movable cylinders 271 with respect to the cylindrical bodies 101. Thus, after the cylindrical bodies 101 are abutted against each other, the locking pieces 122 and the locking pieces 130 in the protection cylinders 110 are rotated together with the corresponding movable cylinders 271 to perform positioning in the circumferential direction, thereby facilitating the coupling operation.

[0069] To disengage these locking pieces, the disengaging pieces 282 are moved forward. Then, the distal end portions of the disengaging pieces 282 are brought into contact with the inclined surface portions of the locking pieces 130 to move the locking pieces 130 outwardly in the radial direction, thereby disengaging the locking pieces 130 from the locking pieces 122.

[0070] This embodiment has the same arrangement as that of the first embodiment described above except for the above respects. Portions of the seventh embodiment identical to those of the first embodiment are denoted by the same reference numerals, and a description thereof will be omitted.

[0071] The present invention is not limited to the embodiments described above, in which each coupler has a pair of locking members and a pair of to-be-locked members. It may be applied to a small coupling apparatus in which each coupler has one locking member and one to-be-locked member, and also to a large coupling apparatus in which each coupler has three or more locking members and three or more to-be-locked members.

Claims

1. A coupling apparatus comprising a pair of couplers (101A, 101B) that are to be coupled to each other, have substantially the same structure, and are complementary to each other;

   said couplers have cylindrical bodies (101) having distal end faces that are abutted against each other when said couplers are coupled to each other; and

   said cylindrical bodies (101) have at least a pair of locking members (120) and a pair of to-be-locked members (130) serving to engage with said locking members (120) of said couplers that are opposite, that oppose each other when said distal end faces of said cylindrical bodies are abutted against each other in an axial direction, thereby coupling said pair of couplers;

   characterized in that said locking members (120) are guided to be movable with respect to said cylindrical bodies (101) in the axial direction and comprise elastic means (127) for biasing said locking members to move backward in a direction opposite to distal ends of said cylindrical bodies; when said couplers (101A, 101B) are in an uncoupled state, said locking members are moved to a retreat position by said elastic means and distal end portions of said locking members (120) are maintained in a state not or only slightly projecting from distal ends of said cylindrical bodies (101); and when said pair of couplers are in a coupled state, said locking members are moved forward against a biasing force of said elastic means (127) and engage with said to-be-locked members (130) of said couplers that oppose each other.

2. An apparatus according to claim 1, characterized in that said couplers (101A, 101B) have disengaging mechanisms (140, 260, 280) for disengaging said to-be-locked members (130) from said locking members (120) of said couplers that oppose each other.

3. An apparatus according to any one of claims 1 or 2, characterized in that each of said couplers (101A, 101B) comprises a locking member (120) having a pair of locking pieces (122) and a pair of to-be-locked members (130), said pair of locking pieces (122) are arranged to be separated from each other by 180° in a circumferential direction of said cylindrical bodies (101), said locking pieces (122) have a width which is set within a range of about 90° in the circumferential direction of said cylindrical bodies, said pair of couplers (101A, 101B) are coupled to each other with an angular shift of about 90° from each other in the circumferential direction, and said pair of locking pieces (122) are moved forward to be fitted between said pair of locking pieces (122) of said couplers that oppose each other.

4. An apparatus according to claim 3, characterized in that said locking members (120) and said to-be-locked members (130) are rotatable with respect to said cylindrical bodies (101).

5. An apparatus according to claim 2, characterized in that said disengaging mechanisms have disengaging pieces (282) which are movable in the axial direction of said cylindrical bodies (101), and when said disengaging pieces (282) are moved in the ax-

ial direction, said disengaging pieces are brought into contact with said to-be-locked members (130) and set said to-be-locked members in a disengaged state, thereby disengaging said to-be-locked members from said locking members.

6. An apparatus according to claim 2, characterized in that said disengaging mechanisms (140) move said to-be-locked members (130) outwardly in a radial direction of said cylindrical bodies (101), thereby disengaging said to-be-locked members (130) from said locking members (120).

7. An apparatus according to claim 2, characterized in that said disengaging mechanisms (260) move said to-be-locked members (130) in a radial direction of said cylindrical bodies (101), thereby disengaging said to-be-locked members from said locking members (120).

8. An apparatus according to claim 5, characterized in that while said pair of couplers (101A, 101B) are coupled to each other, said pair of couplers are disconnected only when said disengaging pieces (282) are moved in directions to come close to each other.

9. An apparatus according to claim 6, characterized in that said disengaging mechanisms (140) respectively comprise substantially elliptic elastic rings (141, 151) having an elasticity; said to-be-locked members (130) of each disengaging mechanism are mounted on an inner circumference of a corresponding one of said substantially elliptic elastic rings (141, 151) at two portions on a minor axis thereof; said to-be-locked members (130) are biased inwardly in a radial direction by an elastic force of said elastic rings and engage with said locking members (120); and when each of said substantially elliptic elastic rings (141, 151) is depressed at two portions on a major axis thereof inwardly in the radial direction, said substantially elliptic elastic rings are deformed to be substantially circular, and said to-be-locked members (130) are moved outwardly in the radial direction, thereby disengaging said to-be-locked members from said locking members (120).

10. An apparatus according to claim 6, characterized in that said disengaging mechanisms (140) respectively comprise rings (161, 171) which are rotatable in a circumferential direction of said cylindrical bodies (101) or movable in the axial direction of said cylindrical bodies; said rings (161, 171) and said to-be-locked members (130) have a plurality of permanent magnets (163) arranged in predetermined manners; when N and S poles of said permanent magnets (163) of said rings (161, 171) correspond to N and S poles of said permanent magnets (163) of said to-be-locked members (130), said to-be-locked members (130) are biased inwardly in the radial direction by a repulsive force of said permanent magnets and engage with said locking members (120); and when said rings (161, 171) are rotated in the circumferential direction or is moved in the axial direction, said N and S poles of said permanent magnets of said rings (161, 171) correspond to said S and N poles of said permanent magnets of said to-be-locked members (130), and said to-be-locked members (130) are moved outwardly in the radial direction by an attractive force between said permanent magnets of said rings and said permanent magnets of said to-be-locked members, thereby disengaging said to-be-locked members (130) from said locking members (120).

11. An apparatus according to claim 1, characterized in that said distal end faces of said cylindrical bodies (101) of said pair of couplers (101A, 101B) respectively have packing members (104) made of an elastic material, and when said pair of couplers are coupled to each other, said packing members (104) are interposed between said distal end faces of said cylindrical bodies (101), thereby maintaining a hermetic seal.

12. An apparatus according to claim 1, characterized in that said pair of couplers (101A, 101B) respectively have protection cylinders (110) which are brought into contact with either inner or outer side surfaces of said locking members (120) and said to-be-locked members (130), thereby preventing a deformation or shift of said locking members or said to-be-locked members.

13. An apparatus according to claim 1, characterized in that said distal end faces of said cylindrical bodies of said pair of couplers have communication wire connection terminals which are electrically connected to each other when said couplers are coupled to each other.

14. An apparatus according to claim 1, characterized in that said pair of couplers (101A, 101B) are respectively connected to hoses (102) to hydraulically connect said hoses to each other.

Patentansprüche

1. Eine Kupplungsvorrichtung mit einem Paar von Kupplungen (101A, 101B), welche miteinander zu verbinden sind, im wesentlichen den gleichen Aufbau haben und zueinander komplementär sind;

wobei die Kupplungen zylindrische Körper

(101) mit distalen Endflächen haben, welche aneinanderliegen, wenn die Kupplungen miteinander verbunden sind; und

wobei die zylindrischer Körper (101) wenigstens ein Paar von Verriegelungsteilen (120) und ein Paar von zu verriegelnden Teilen (130) haben, welche dazu dienen, in Eingriff mit den Verriegelungsteilen (120) der einander gegenüberliegenden Kupplungen zu gelangen, und welche einander gegenüberliegen, wenn die distalen Endflächen der zylindrischen Körper in axialer Richtung aneinanderliegen, wodurch das Paar von Kupplungen miteinander verbunden wird;

dadurch gekennzeichnet, daß die Verriegelungsteile (120) geführt sind, um bezüglich der zylindrischen Körper (101) in axialer Richtung beweglich zu sein und eine elastische Vorrichtung (127) aufweisen, um die Verriegelungsteile so vorzuspannen, daß sie sich nach hinten in eine Richtung entgegengesetzt zu den distalen Enden der zylindrischen Körper bewegen; wobei, wenn die Kupplungen (101A, 101B) in einem nicht verbundenen Zustand sind, dann die Verriegelungsteile durch die elastische Vorrichtung in eine zurückgezogene Position bewegt werden und distale Endabschnitte der Verriegelungsteile (120) in einem Zustand gehalten werden, wo sie nicht oder nur geringfügig von den distalen Enden der zylindrischen Körper (101) vorstehen; und wobei, wenn das Paar von Kupplungen in einem verbundenen Zustand ist, die Verriegelungsteile entgegen einer Vorspannkraft der elastischen Vorrichtung (127) nach vorne bewegt werden und mit den zu verriegelnden Teilen (130) der Kupplungen in Eingriff gelangen, welche einander gegenüberliegen.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Kupplungen (101A, 101B) einen Trennmechanismus (140, 260, 280) haben, um die zu verriegelnden Teile (130) von den Verriegelungsteilen (120) der einander gegenüberliegenden Kupplungen zu trennen.

3. Vorrichtung nach einem der Ansprüche 1 oder 2, dadurch gekennzeichnet, daß jede der Kupplungen (101A, 101B) ein Verriegelungsteil (120) mit einem Paar von Verriegelungsstücken (122) und einem Paar von zu verriegelnden Teilen (130) aufweist, wobei das Paar von Verriegelungsstücken (122) so angeordnet ist, daß sie in Umfangsrichtung der zylindrischen Körper (101) und um 180° voneinander beabstandet sind, wobei die Verriegelungsstücke (122) eine Breite haben, welche in einem Bereich von ungefähr 90° in Umfangsrichtung der zylindrischen Körper liegt, wobei das Paar von Kupplungen (101A, 101B) miteinander durch eine Winkelverschiebung von ungefähr 90° zueinander in Umfangsrichtung verbunden wird und das Paar von Verriegelungsstücken (122) vorwärts bewegt wird, um zwischen das Paar von Verriegelungsstücken (122) der gegenüberliegenden Kupplung eingesetzt zu werden.

4. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß die Verriegelungsteile (120) und die zu verriegelnden Teile (130) bezüglich der zylindrischen Körper (101) drehbar sind.

5. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß die Trennmechanismen Trennstücke (282) aufweisen, welche in axialer Richtung der zylindrischen Körper (101) beweglich sind, und, wenn die Trennstücke (282) in axialer Richtung bewegt werden, dann die Trennstücke in Anlage mit den zu verriegelnden Teilen (130) gebracht werden und die zu verriegelnden Teile in einen Trennzustand versetzen, wodurch die zu verriegelnden Teile von den Verriegelungsteilen getrennt werden.

6. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß die Trennmechanismen (140) die zu verriegelnder Teile (130) in radialer Richtung der zylindrischen Korper (101) nach außen bewegen, wodurch die zu verriegelnden Teile (130) von den Verriegelungsteilen (120) getrennt werden.

7. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß die Trennmechanismen (260) die zu verriegelnden Teile (130) in radialer Richtung der zylindrischen Körper (101) bewegen, wodurch die zu verriegelnden Teile von den Verriegelungsteilen (120) getrennt werden.

8. Vorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß, während das Paar von Kupplungen (101A, 101B) miteinander verbunden wird, das Paar von Kupplungen nur dann getrennt wird, wenn die Trennstücke (282) in Richtungen so bewegt werden, daß sie sich einander nähern.

9. Vorrichtung nach Anspruch 6, dadurch gekennzeichnet, daß die Trennmechanismen (140) jeweils im wesentlichen elliptische elastische Ringe (141, 151) aufweisen, welche eine Elastizität haben; daß die zu verriegelnden Teile (130) eines jeden Trennmechanismus an einem inneren Umfang eines entsprechenden der im wesentlichen elliptischen elastischen Ringe (141, 151) an zwei Abschnitten einer kurzen Hauptachse hiervon angeordnet sind; daß die zu verriegelnden Teile (130) in radialer Richtung durch eine elastische Kraft der elastischen Ringe nach innen vorgespannt sind und in Eingriff mit den Verriegelungsteilen (120) gelangen;

und daß, wenn jeder der im wesentlichen elliptischen elastischen Ringe (141, 151) an zwei Abschnitten einer langen Hauptachse hiervon in radialer Richtung nach innen gedruckt wird, dann die im wesentlichen elliptischen elastischen Ringe im wesentlichen in Kreisform verformt werden und die zu verriegelnden Teile (130) in radialer Richtung nach außen bewegt werden, wodurch die zu verriegelnden Teile von den Verriegelungstellen (120) getrennt werden.

10. Vorrichtung nach Anspruch 6, dadurch gekennzeichnet, daß die Trennmechanismen (140) jeweils Ringe (161, 171) aufweisen, welche in Umfangsrichtung der zylindrischen Körper (101) drehbar oder in axialer Richtung der zylindrischen Körper beweglich sind; daß die Ringe (161, 171) und die zu verriegelnden Teile (130) eine Mehrzahl von Permanentmagneten (163) aufweisen, welche auf bestimmte Weise angeordnet sind; daß, wenn die N- und S-Pole der Permanentmagneten (163) der Ringe (161, 171) N- und S-Polen der Permanentmagneten (163) des zu verriegelnden Teiles (130) entsprechen, dann die zu verriegelnden Teile (130) in radialer Richtung durch eine Abstoßkraft der Permanentmagnete nach innen vorgespannt werden und mit den Verriegelungsteilen (120) in Eingriff gelangen; und daß, wenn die Ringe (161, 171) in Umfangsrichtung gedreht werden oder in axialer Richtung bewegt werden, dann die N- und S-Pole der Permanentmagnete der Ringe (161, 171) den S- und N-Polen der Permanentmagnete der zu verriegelnden Teile (130) entsprechen und die zu verriegelnden Teile (130) in radialer Richtung durch eine Anziehungskraft zwischen den Permanentmagneten der Ringe und dem Permanentmagneten der zu verriegelnden Teile nach außen bewegt werden, wodurch die zu verriegelnden Teile (130) von den Verriegelungsteilen (120) getrennt werden.

11. Vorrichtung nach Anspruch 1, dadurch gekennzeichnnet, daß die distalen Endflächen der zylindrischen Körper (101) des Paares von Kupplungen (101A, 101B) jeweils Dichtteile (104) aus einem elastischen Material haben, wobei, wenn das Paar von Kupplungen miteinander verbunden wird, die Dichtteile (104) zwischen den distalen Endflächen der zylindrischen Körper (101) zu liegen kommen, wodurch eine hermetische Abdichtung aufrecht erhalten wird.

12. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Paar von Kupplungen (101A, 101B) jeweils Schutzzylinder (110) aufweist, welche in Kontakt entweder mit den inneren oder äußeren Seitenflächen der Verriegelungsteile (120) und der zu verriegelnden Teile (130) gebracht werden, wodurch eine Verformung oder eine Verschiebung der Verriegelungsteile oder zu verriegelnden Teile verhindert wird.

13. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die distalen Endflächen der zylindrischen Körper des Paares von Kupplungen Verbindungsanschlüsse für eine Übertragungsleitung haben, welche elektrisch miteinander verbunden werden, wenn die Kupplungen miteinander verbunden werden.

14. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Paar von Kupplungen (101A, 101B) jeweils mit Schläuchen (102) verbunden ist, um die Schläuche hydraulisch miteinander zu verbinden.

Revendications

1. Appareil de raccordement comprenant une paire de dispositifs de raccordement (101A, 101B) qui doivent être raccordés l'un à l'autre, qui ont sensiblement la même construction et qui sont complémentaires l'un de l'autre ;

   lesdits dispositifs de raccordement comportent des corps cylindriques (101) comportant des faces d'extrémites distales qui sont appuyées l'une contre l'autre lorsque lesdits dispositifs de raccordement sont raccordés l'un à l'autre ; et lesdits corps cylindriques (101) comportent au moins une paire d'éléments de verrouillage (120) et une paire d'éléments à verrouiller (130) servant à s'engager avec lesdits éléments de verrouillage (12C) desdits dispositifs de raccordement qui sont opposés, qui s'opposent l'un à l'autre lorsque lesdites faces d'extrémités distales desdits corps cylindriques sont appuyées l'une contre l'autre dans une direction axiale, raccordant de ce fait ladite paire de dispositifs de raccordement ;

   caractérisé en ce que lesdits éléments de verrouillage (120) sont guidés pour être mobiles par rapport auxdits corps cylindriques (101) dans la direction axiale et comprennent un moyen élastique (127) pour presser lesdits éléments de verrouillage pour se déplacer vers l'arrière dans une direction opposée aux extrémités distales desdits corps cylindriques ; lorsque lesdits dispositifs de raccordement (101A, 101B) sont dans un état non raccordé, lesdits éléments de verrouillage sont déplacés vers une position de retraite par lesdits moyens élastiques et lesdites parties d'extrémités distales àesdits éléments de verrouillage (120) sont maintenues dans un état ne dépassant ou dépassant seulement légèrement des extrémités distales des-

dits corps cylindriques (101) ; et lorsque ladite paire de dispositifs de raccordement est dans un état raccordé, lesdits éléments de verrouillage sont déplacés vers l'avant contre une force de pression desdits moyens élastiques (127) et s'engagent avec lesdits éléments à verrouiller (130) desdits dispositifs de raccordement qui s'opposent l'un à l'autre.

2. Appareil selon la revendication 1, caractérisé en ce que lesdits dispositifs de raccordement (101A, 101B) ont des mécanismes de désengagement (140, 260, 280) pour désengager lesdits éléments à verrouiller (130) desdits éléments de verrouillage (120) desdits dispositifs de raccordement qui s'opposent l'un à l'autre.

3. Appareil selon l'une quelconque des revendications 1 ou 2, caractérisé en ce que chacun desdits dispositifs de raccordement (101A, 101B) comprend un élément de verrouillage (120) comportant une paire de pièces de verrouillage (122) et une paire d'éléments à verrouiller (130), ladite paire de pièces de verrouillage (122) est disposée pour que les pièces soient séparées l'une de l'autre par 180° dans une direction circonférentielle desdits corps cylindriques (101), lesdites pièces de verrouillage (122) ont une largeur qui est établie à l'intérieur d'une plage d'environ 90° dans la direction circonférentielle desdits corps cylindriques, ladite paire de dispositifs de raccordement (101A, 101B) qui sont raccordés l'un à l'autre avec un décalage angulaire d'environ 90° de l'un à l'autre dans la direction circonférentielle, et ladite paire de pièces de verrouillage (122) sont déplacées vers l'avant afin d'être ajustées entre ladite paire de pièces de verrouillage (122) desdits dispositifs de raccordement qui s'opposent l'un à l'autre.

4. Appareil selon la revendication 3, caractérisé en ce que lesdits éléments de verrouillage (120) et lesdits éléments à verrouiller (130) sont rotatifs par rapport auxdits corps cylindriques (101).

5. Appareil selon la revendication 2, caractérisé en ce que lesdits mécanismes de désengagement comportent des pièces de désengagement (282) qui peuvent être déplacées dans la direction axiale desdits corps cylindriques (101) et lorsque lesdites pièces de désengagement (282) sont déplacées dans la direction axiale, lesdites pièces de désengagement sont amenées en contact avec lesdits éléments à verrouiller (130) et établissent lesdits éléments à verrouiller dans un état désengagé, désengageant de ce fait lesdits éléments à verrouiller desdits éléments de verrouillage.

6. Appareil selon la revendication 2, caractérisé en ce que lesdits mécanismes de désengagement (140) déplacent lesdits éléments à verrouiller (130) vers l'extérieur dans une direction radiale desdits corps cylindriques (101), désengageant de ce fait lesdits éléments à verrouiller (130) desdits éléments de verrouillage (120).

7. Appareil selon la revendication 2, caractérisé en ce que lesdits mécanismes de désengagement (260) déplacent lesdits éléments à verrouiller (130) dans une direction radiale desdits corps cylindriques (101), désengageant de ce fait lesdits éléments à verrouiller desdits éléments de verrouillage (120).

8. Appareil selon la revendication 5, caractérisé en ce que bien que ladite paire de dispositifs de raccordement (101A, 101B) soient raccordés l'un à l'autre, ladite paire de dispositifs de raccordement est déconnectée seulement lorsque lesdites pièces de désengagement (262) sont déplacées dans des directions afin de s'approcher l'une de l'autre.

9. Appareil selon la revendication 6, caractérisé en ce que lesdits mécanismes de désengagement (140) comprennent respectivement des bagues élastiques de forme sensiblement elliptiques (141, 151) comportant une élasticité ; lesdits éléments à verrouiller (130) de chaque mécanisme de désengagement sont montés sur une circonférence interne d'une desdites bagues élastiques de forme sensiblement elliptique correspondante parmi lesdites bagues élastiques de forme sensiblement elliptique (141, 151) au niveau de deux parties sur un axe mineur de celle-ci ; lesdits éléments à verrouiller (130) sont pressés vers l'intérieur dans une direction radiale par une force élastique desdites bagues élastiques et s'engagent avec lesdits éléments de verrouillage (120) ; et lorsque chacune desdites bagues élastiques de forme sensiblement elliptique (141, 151) est relâchée au niveau de deux parties situées sur un axe majeur de celle-ci vers l'intérieur dans la direction radiale, lesdites bagues élastiques sensiblement elliptique sont déformées pour être sensiblement circulaires, et lesdits éléments à verrouiller (130) sont déplacés vers l'extérieur dans la direction radiale, désengageant de ce fait lesdits éléments a verrouiller desdits éléments de verrouillage (120).

10. Appareil selon la revendication 6, caractérisé en ce que lesdits mécanismes de désengagement (140) comprennent respectivement des bagues (161, 171) qui peuvent être tournées dans une direction circonférentielle desdits corps cylindriques (101) ou qui peuvent être déplacées dans la direction axiale desdits corps cylindriques ; lesdites bagues (161, 171) et lesdits éléments à verrouiller (130) présentent une pluralité d'aimants permanents (163) disposés de manière prédéterminée ; lorsque les pô-

les N et S desdits aimants permanents (163) desdites bagues (161, 171) correspondent aux pôles N et S desdits aimants permanents (163) desdits éléments à verrouiller (130), lesdits éléments à verrouiller (130) sont pressés vers l'intérieur dans la direction radiale par une force de répulsion desdits aimants permanents et s'engagent avec lesdits éléments de verrouillage (120) ; et lorsque lesdites bagues (161, 171) sont tournées dans la direction circonférentielle ou sont déplacées dans la direction axiale, lesdits pôles N et S desdits aimants permanents desdites bagues (161, 171) correspondent auxdits pôles S et N desdits aimants permanents desdits éléments à verrouiller (130) et lesdits éléments à verrouiller (130) sont déplacés vers l'extérieur dans la direction radiale par une force attractive entre les aimants permanents desdites bagues et lesdits aimants permanents desdits éléments à verrouiller, désengageant de ce fait lesdits éléments à bloquer (130) desdits éléments de verrouillage (120).

11. Appareil selon la revendication 1, caractérisé en ce que lesdites faces d'extrémités distales desdits corps cylindriques (101) de ladite paire de dispositifs de raccordement (101A, 101B) comportent respectivement des éléments d'étanchéité (104) constitués d'un matériau élastique et lorsque ladite paire de dispositifs de raccordement sont raccordés l'un à l'autre, lesdits éléments d'étanchéité (104) sont interposés entre lesdites faces d'extrémités distales desdits corps cylindriques (101), maintenant de ce fait un joint hermétique.

12. Appareil selon la revendication 1, caractérisé en ce que ladite paire de dispositifs de raccordement (101A, 101B) comportent respectivement des cylindres de protection (110) qui sont amenés en contact avec des surfaces latérales, soit internes, soit externes desdits éléments de verrouillage (120) et desdits éléments à verrouiller (130), évitant de ce fait une déformation ou un décalage desdits éléments de verrouillage ou àesdits élément à verrouiller.

13. Appareil selon la revendication 1, caractérisé en ce que lesdites faces d'extrémités distales desdits corps cylindriques de ladite paire de dispositifs de raccordement comportent des bornes de connexion de câbles de communication qui sont connectées électriquement l'une à l'autre lorsque lesdits dispositifs de raccordement sont raccordés l'un à l'autre.

14. Appareil selon la revendication 1, caractérisé en ce que ladite paire de dispositifs de raccordement (101A, 101B) sont respectivement connectés à des tuyaux (102) afin de connecter hydrauliquement lesdits tuyaux l'un à l'autre.

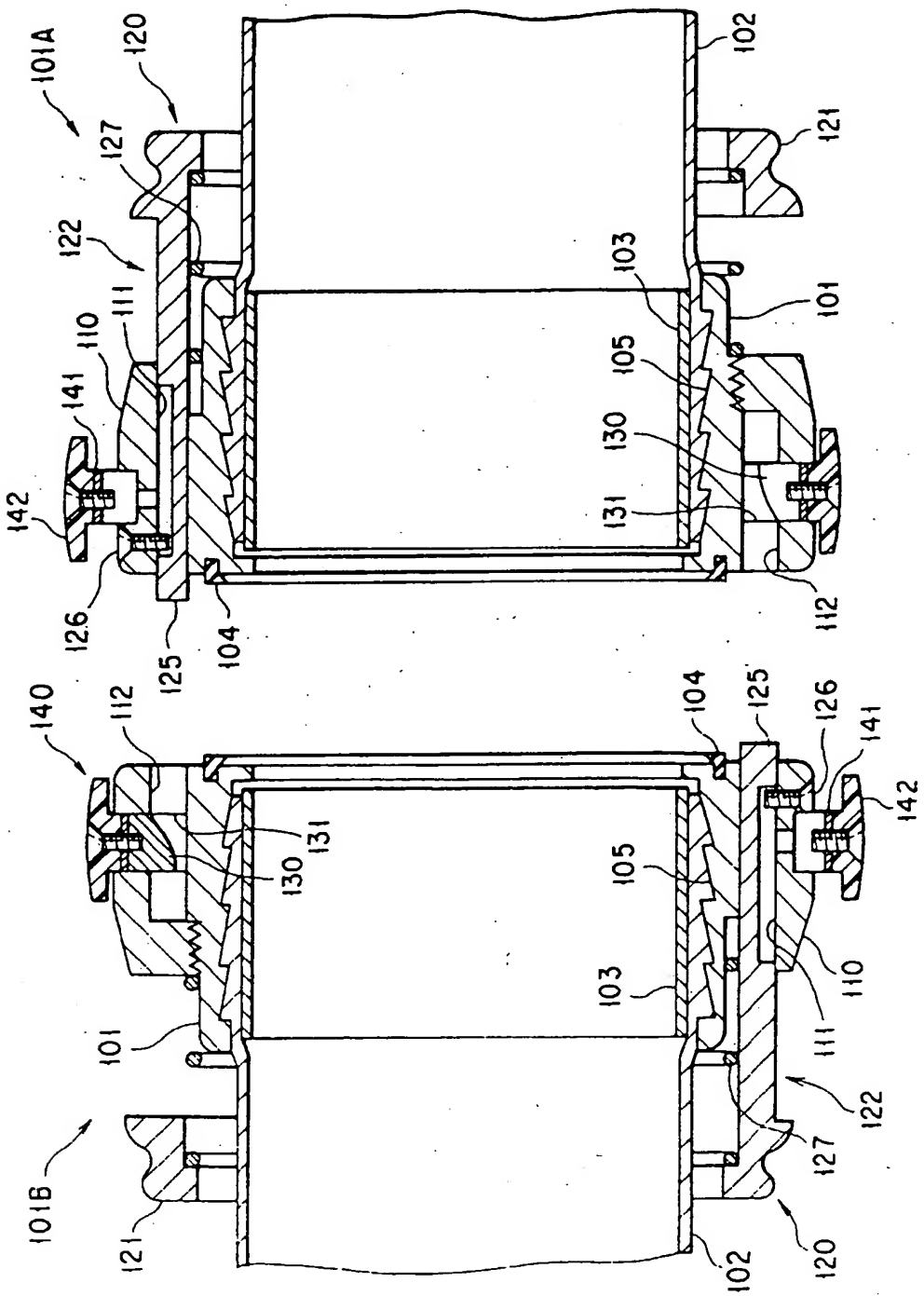
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FIG.1

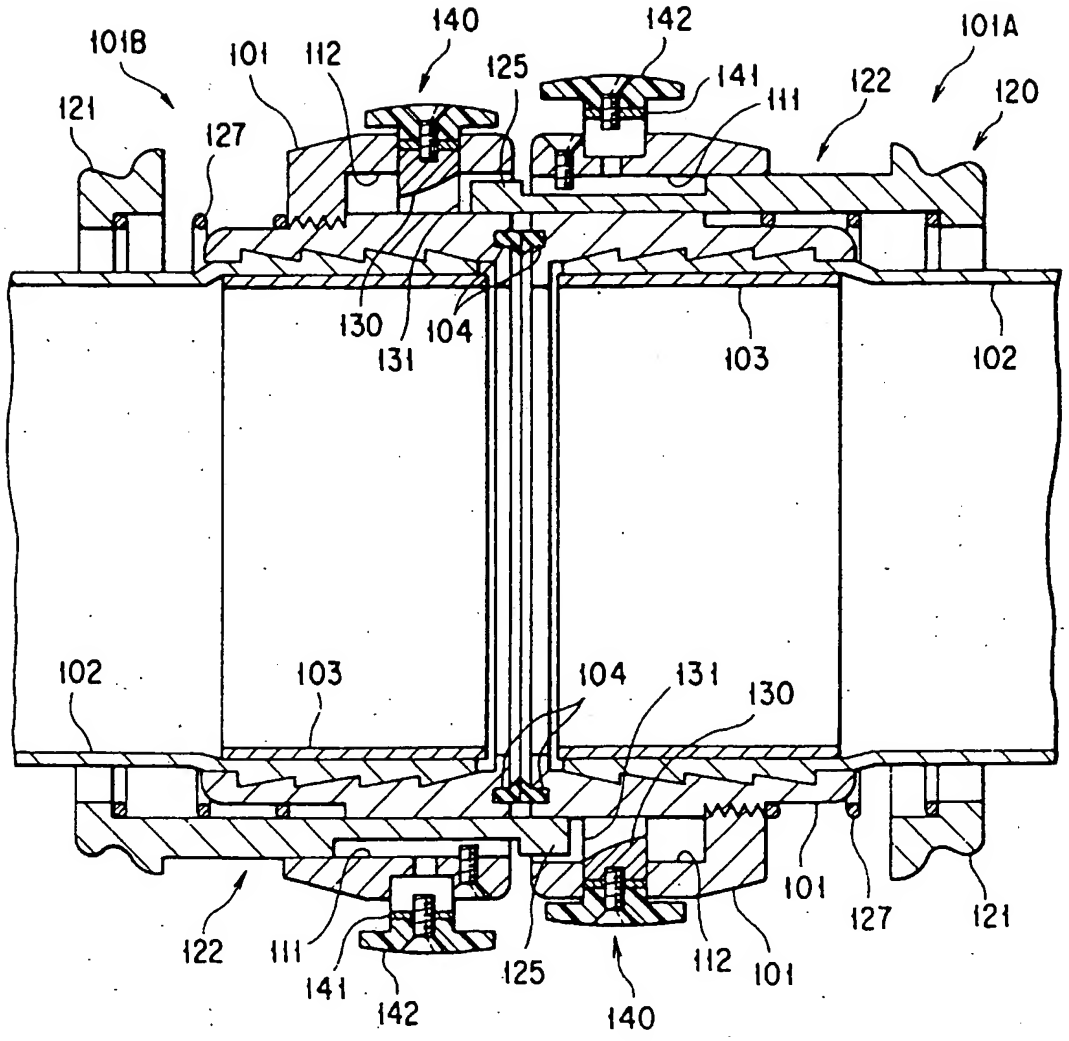
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FIG. 2

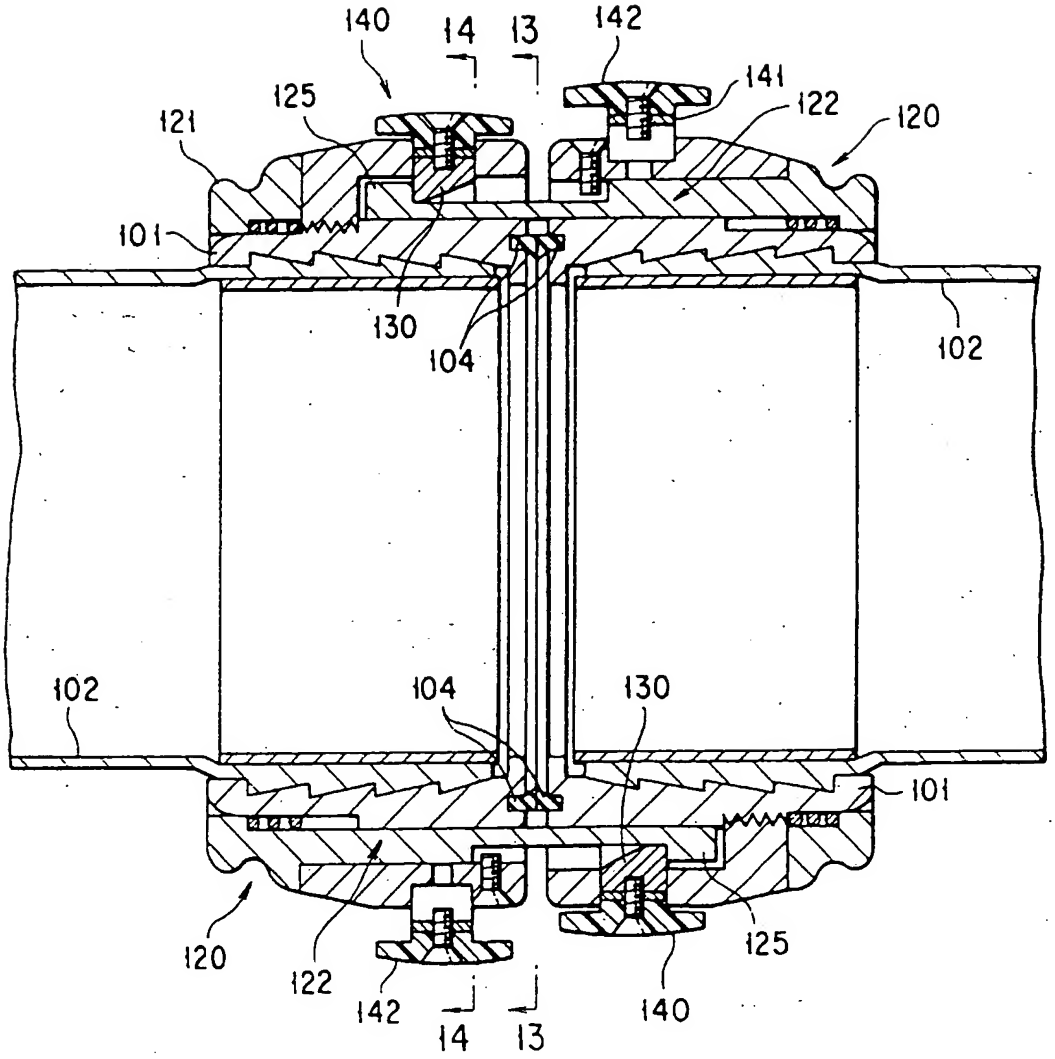
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FIG.3

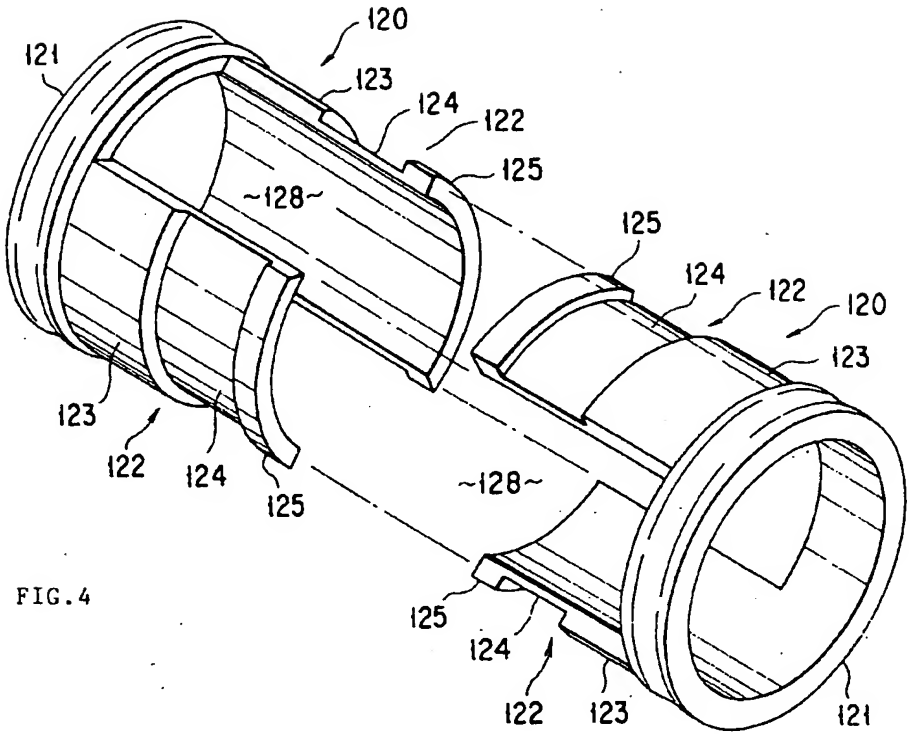
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FIG.4

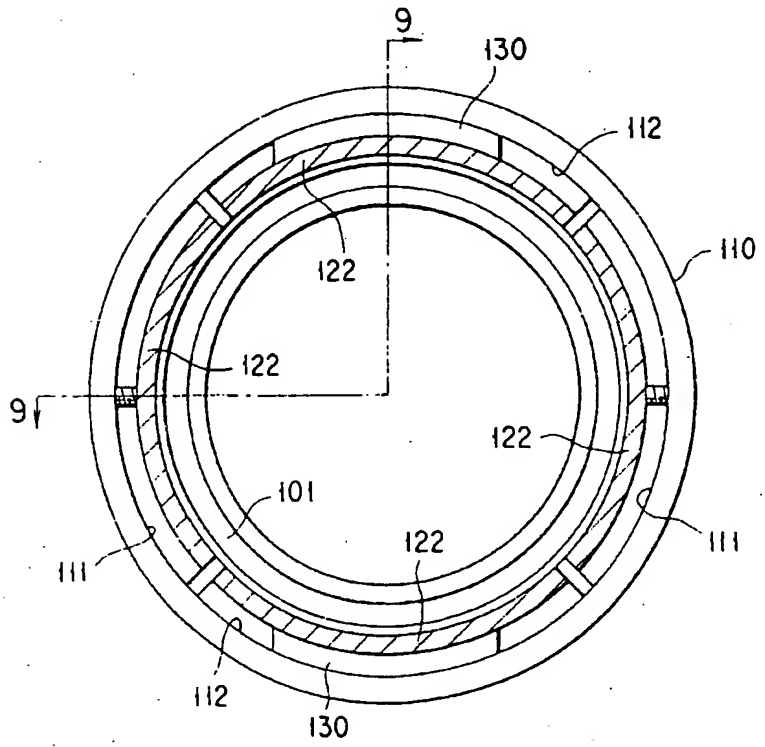
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FIG.5

FIG.6

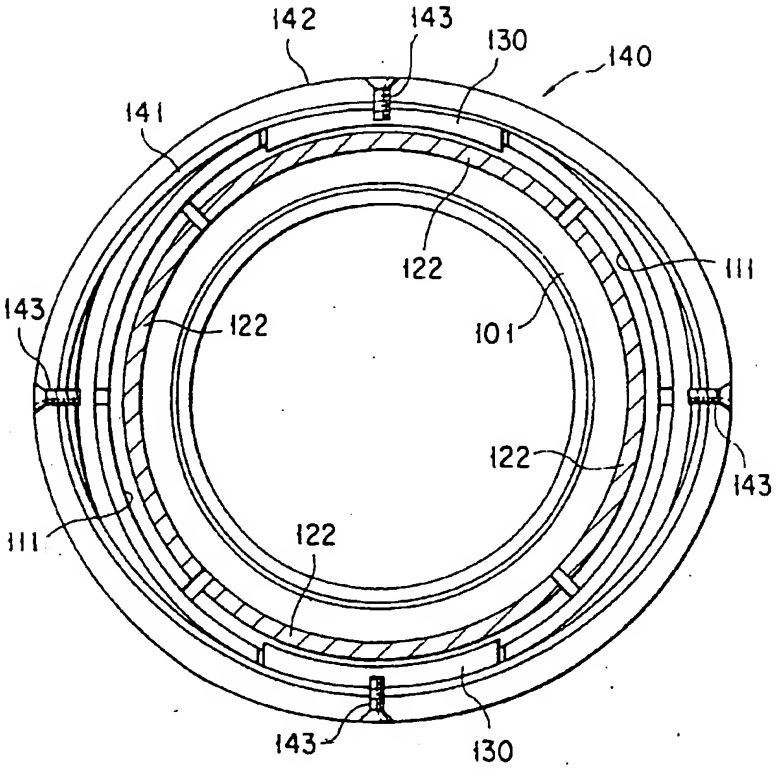
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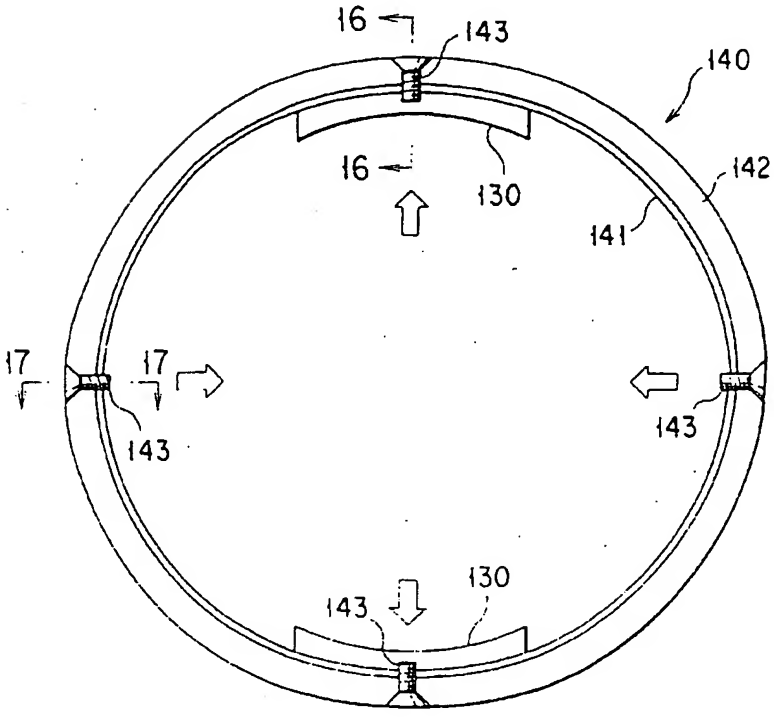
FIG.7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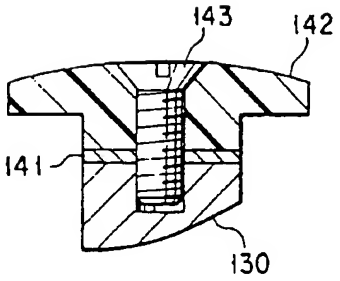


FIG.8

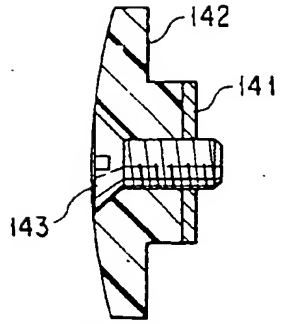
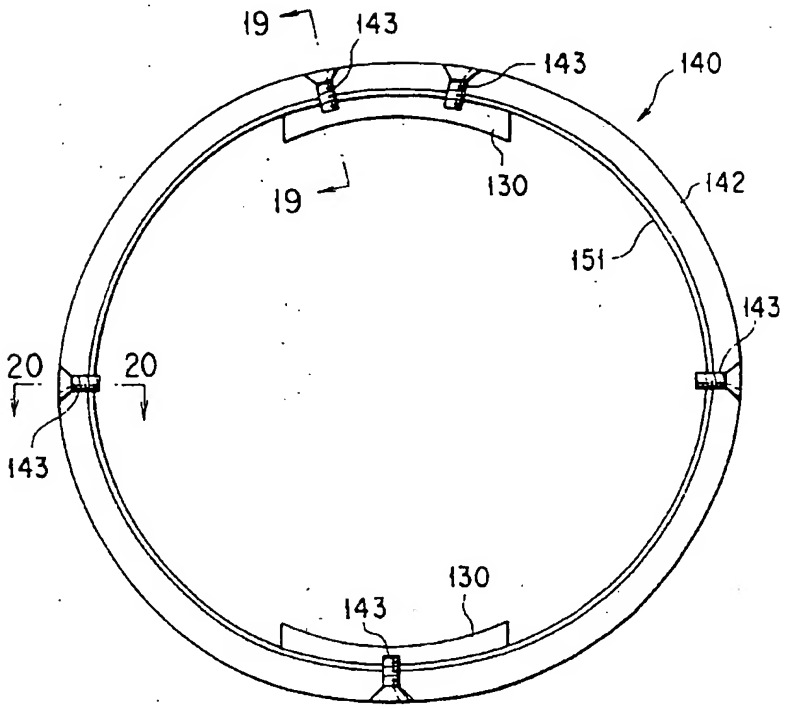


FIG.9

FIG.10



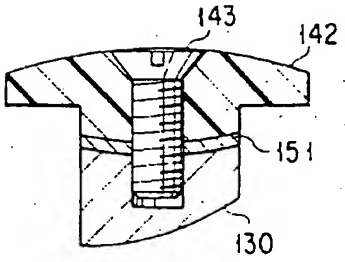


FIG.11

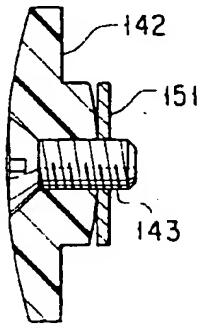


FIG.12

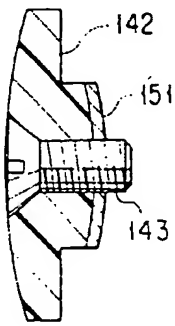


FIG.13

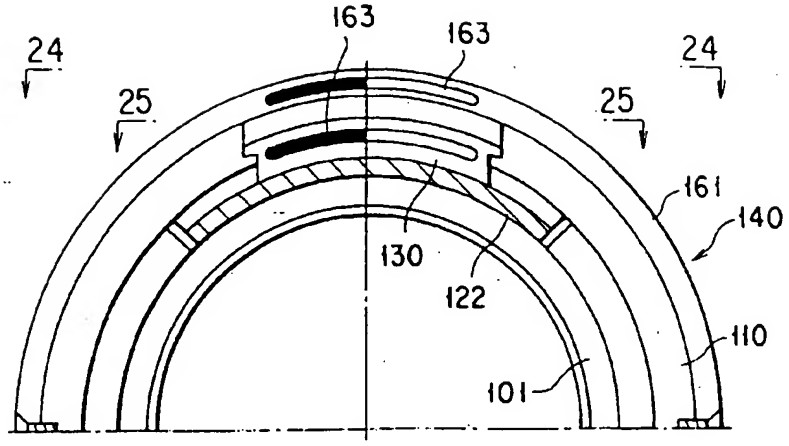


FIG.14

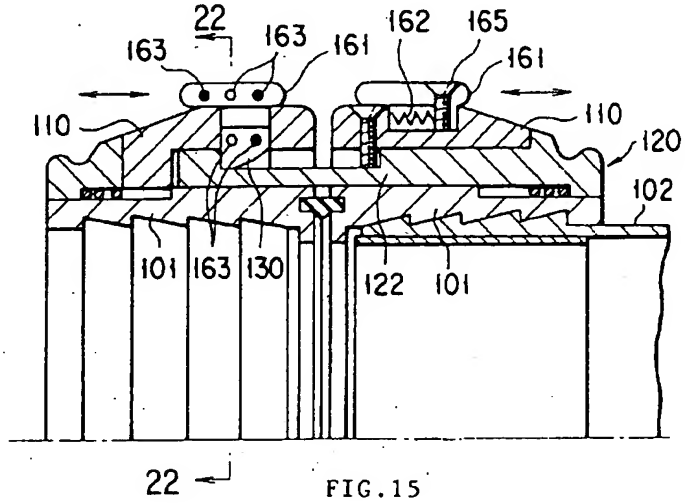


FIG.15

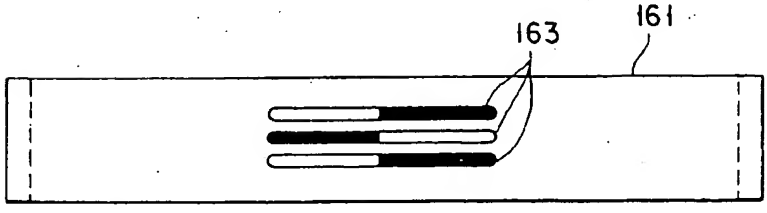


FIG.16

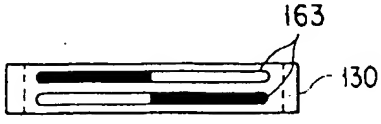


FIG.17

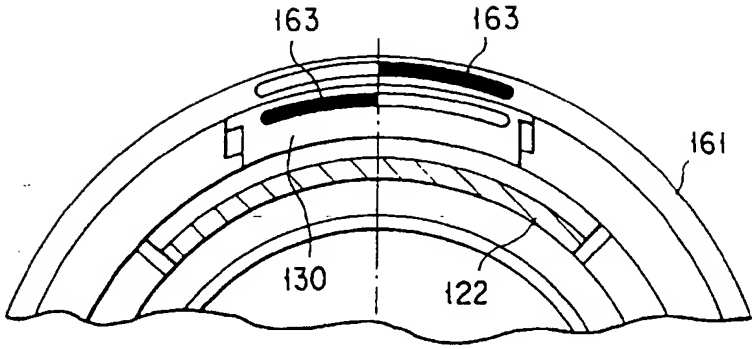
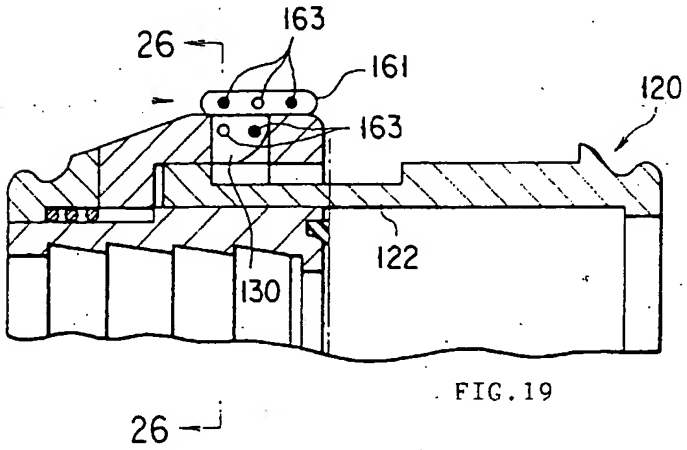


FIG.18



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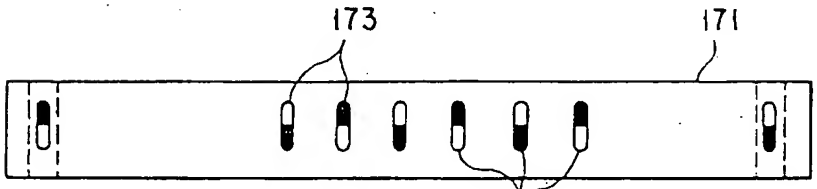

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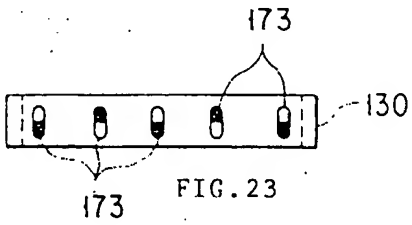

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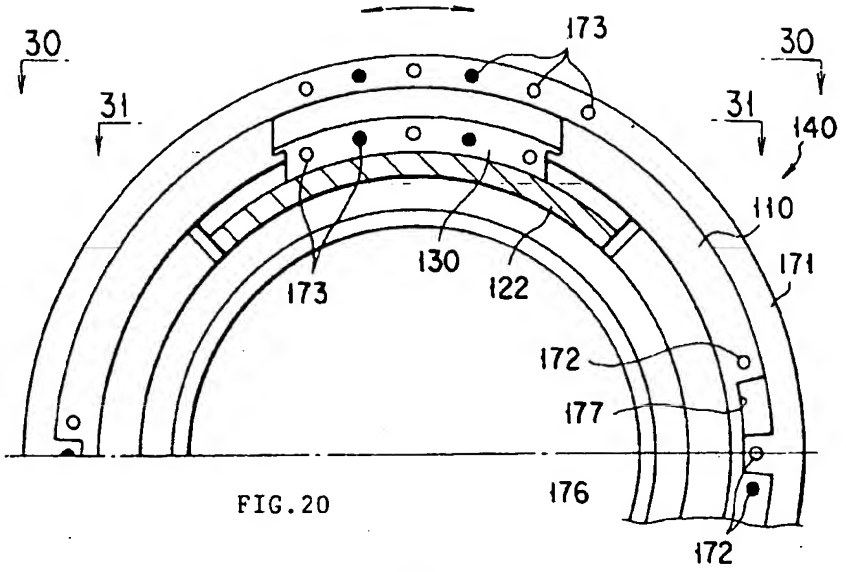

FIG.20

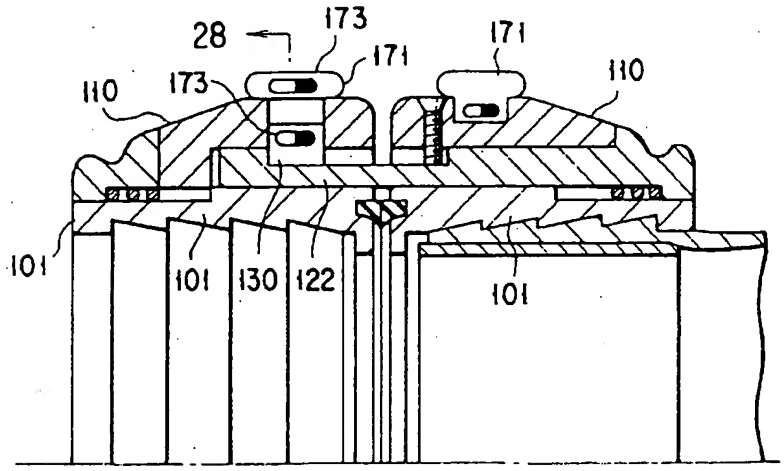

FIG.21

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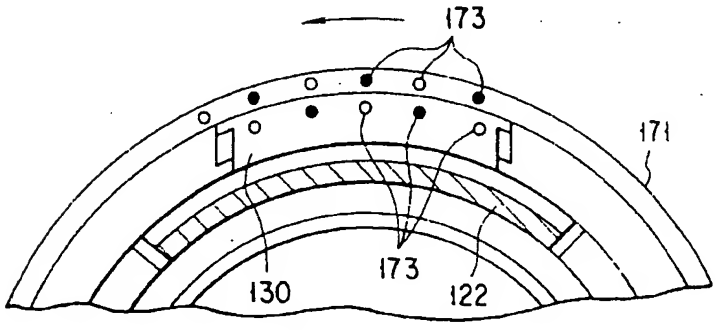

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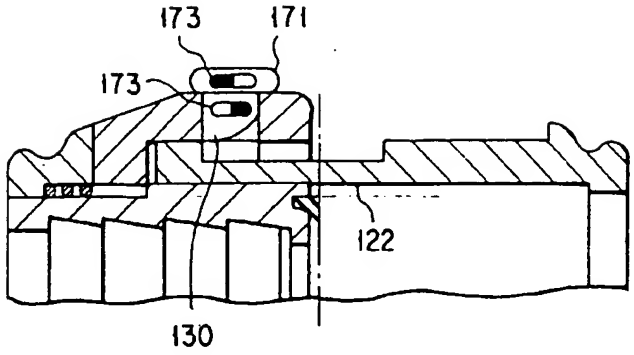

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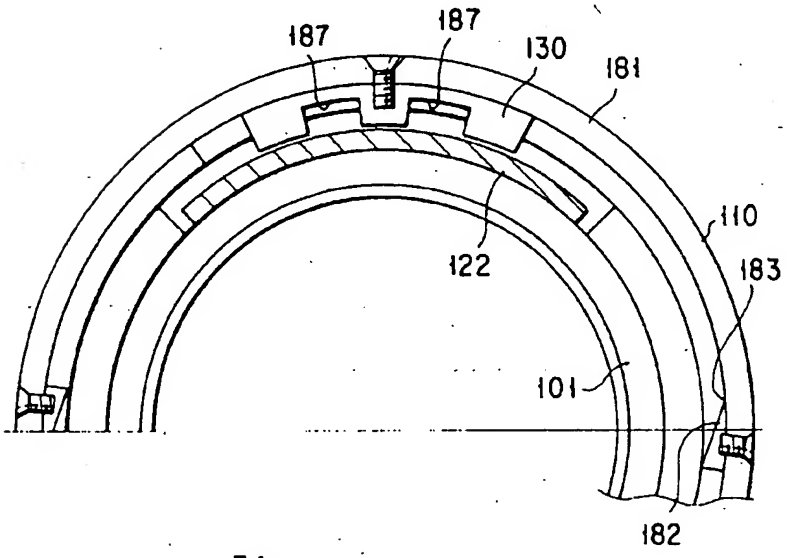
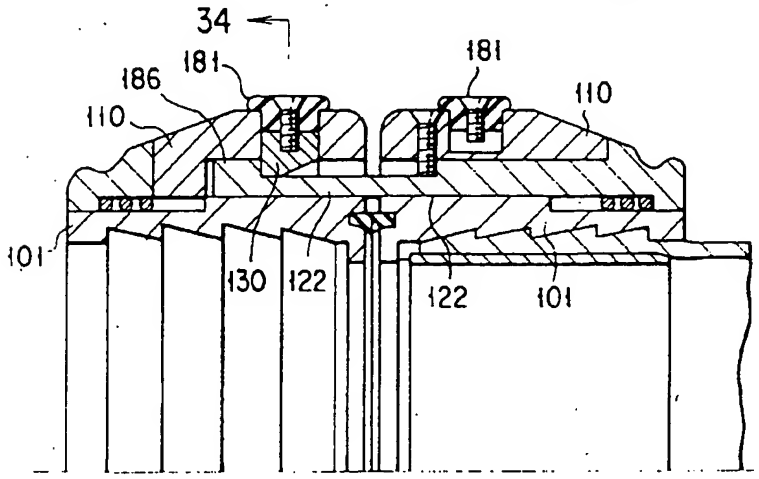


FIG.26



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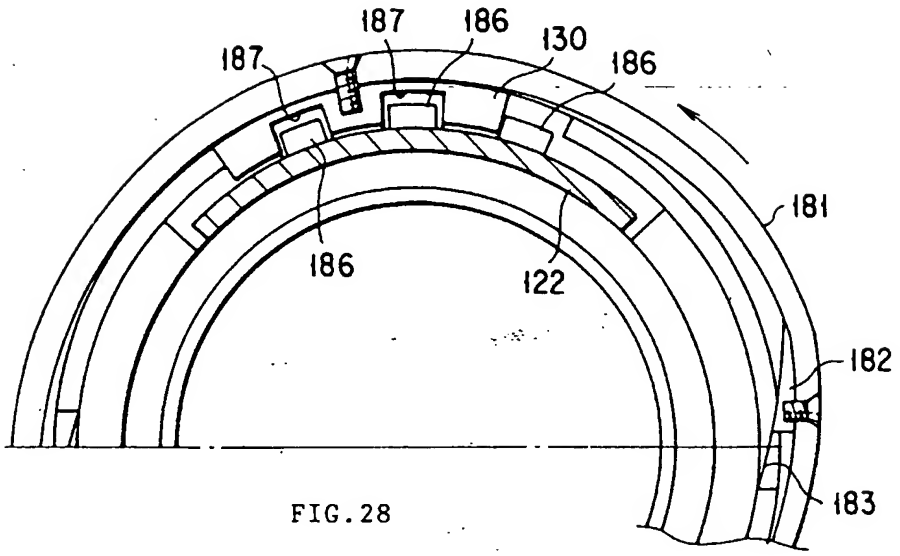
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FIG.28

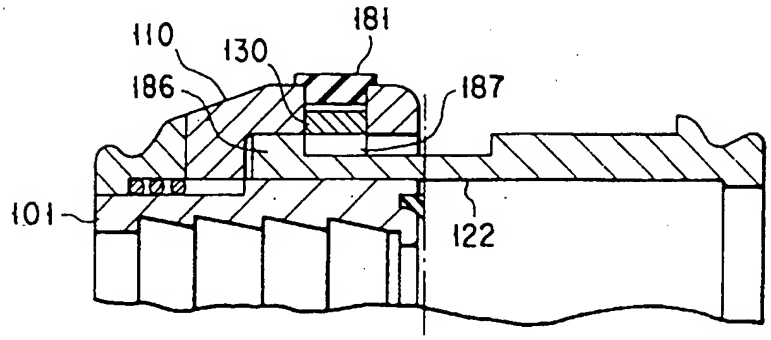
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FIG.29

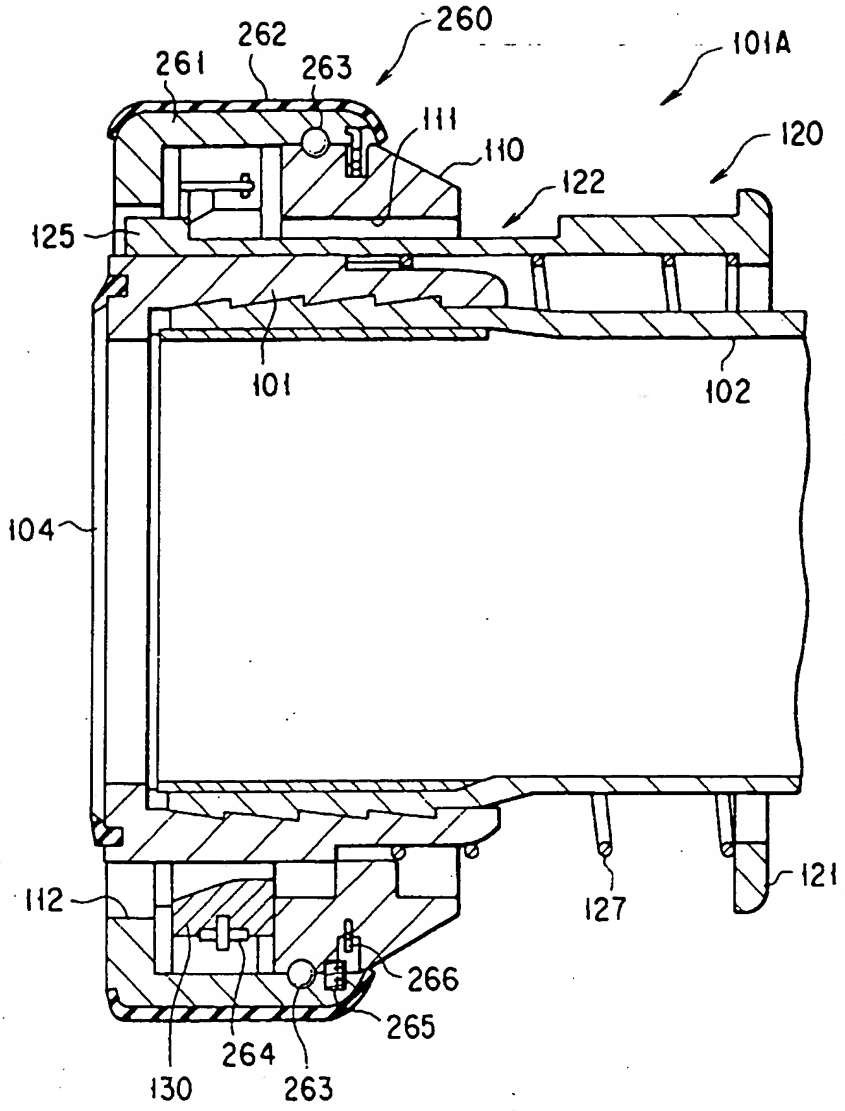
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FIG.30

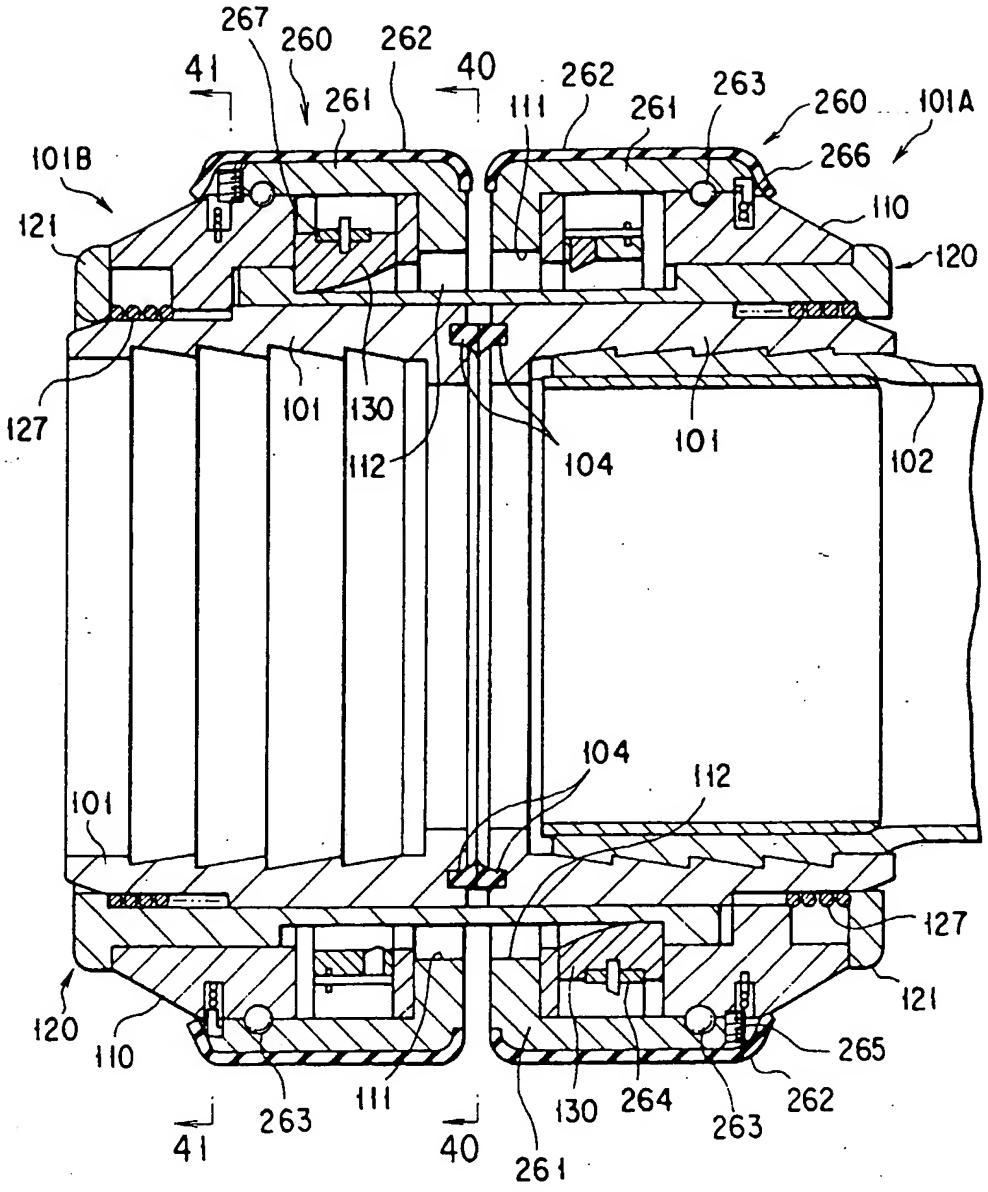
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FIG.31

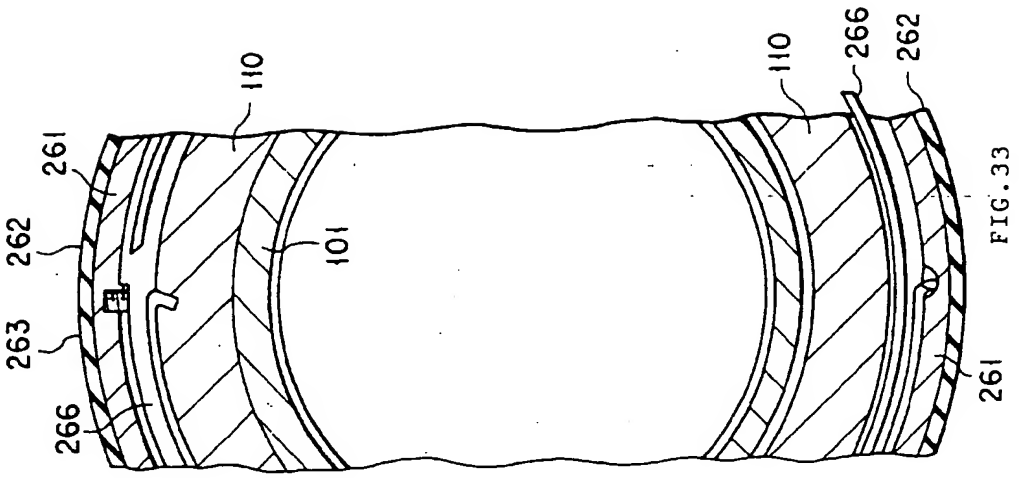
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FIG.33

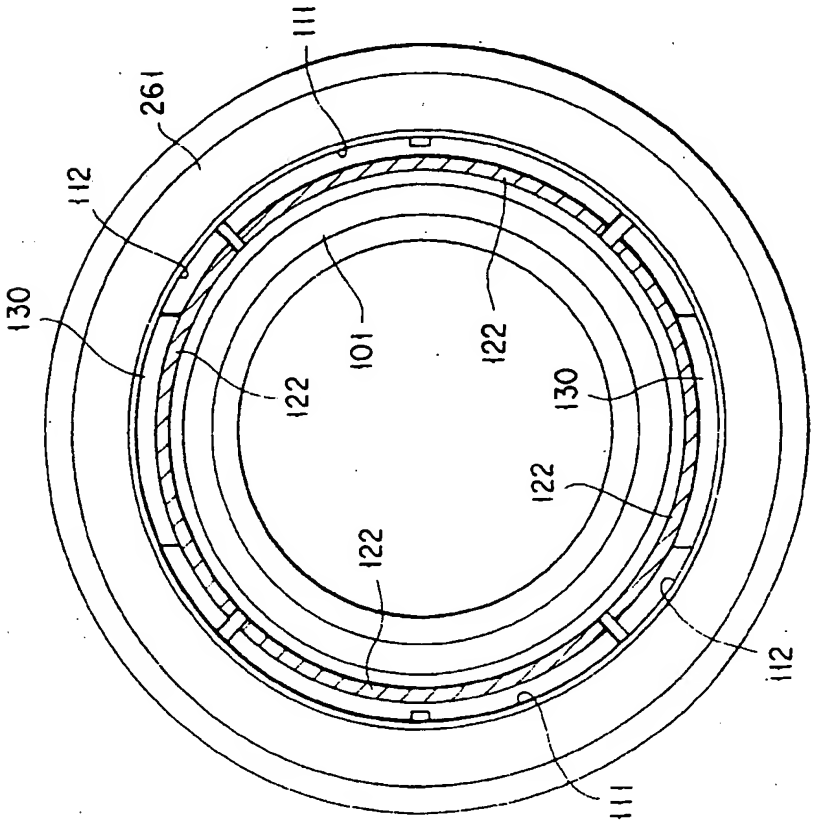
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FIG.32

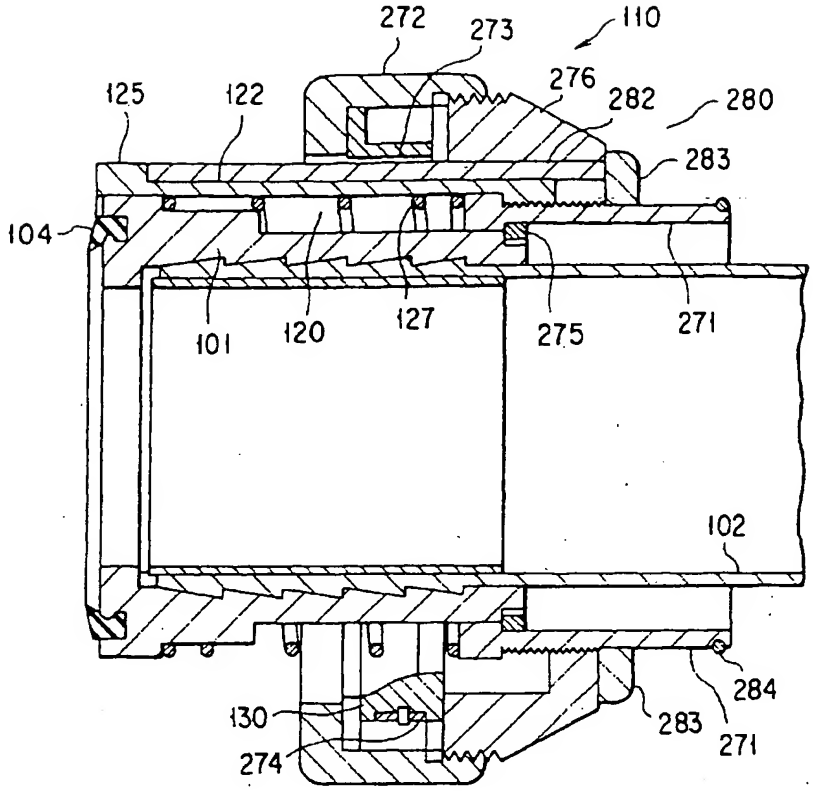
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FIG. 34

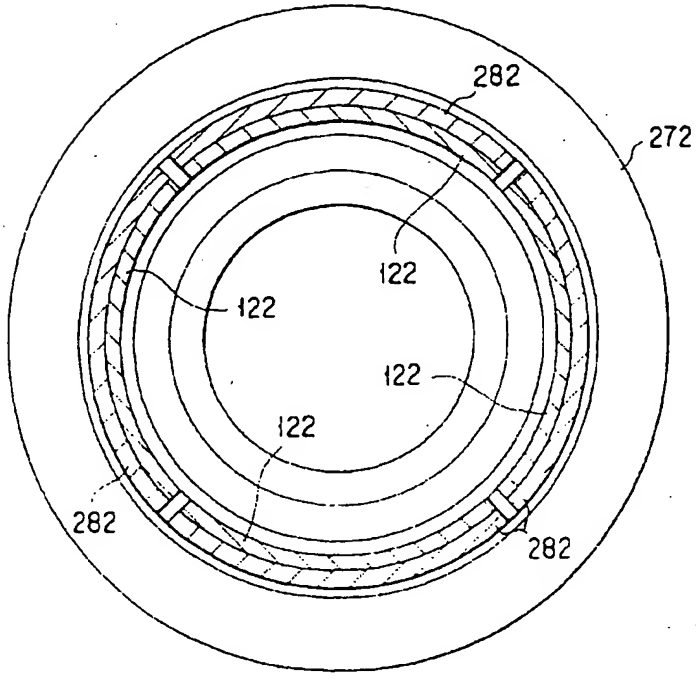
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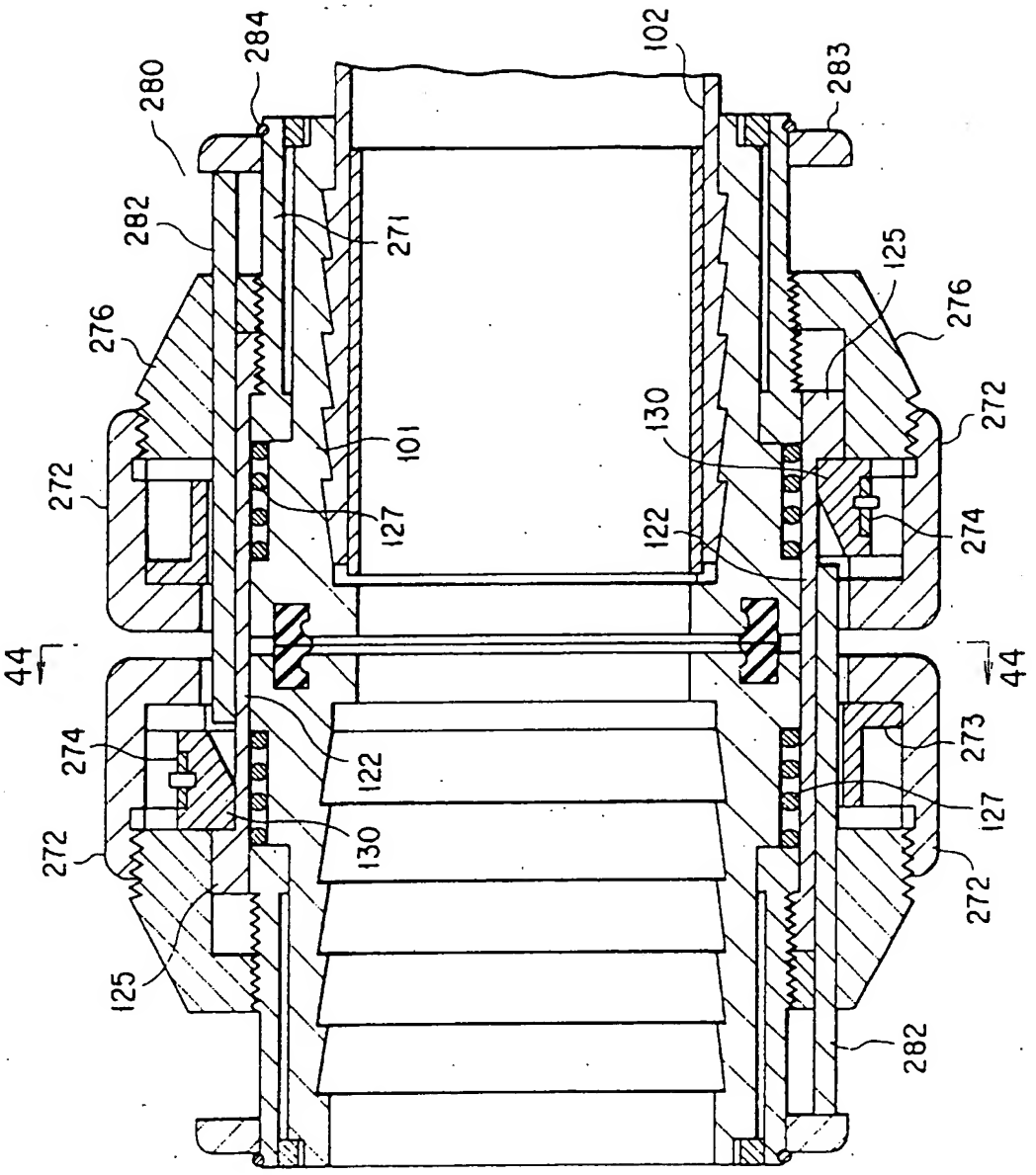
FIG. 36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274
122
273
130
127
272
272
125
282

FIG. 35